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MYCOTAXON

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# DISCOMYCETES EXSICCATI, FASC. II & III

RICHARD P. KORF AND SUSAN C. GRUFF

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It was nearly a quarter century ago that the first fascicle of this set of dried Discomycete specimens was issued (Korf, 1955). It has not been a lack of specimens to issue that has caused this delay, but rather a realization that in many cases the basic taxonomy was incomplete. Moreover, the status of nomenclature was so unfortunate that the names available could scarcely stand the test of time. Several abortive attempts were made by the senior author to prepare additional fascicles for issue: each time he was held back by unanswered questions and doubts.

In the ensuing years the nomenclature of generic names in the Pezizales was clarified by the work of a former student, Joanne K. Rogers, and by the publications of many colleagues, to the point where there are now few grey areas. In the Helotiales, work in the Sclerotiniaceae by another former student, K. P. Dumont, has brought us closer to an understanding of generic limits, and to a sounder nomenclature. Other groups of the Inoperculate Discomycetes are still in some disarray, but certainly the picture today is much brighter than it was when the exsiccati set was planned.

The title of the set has been changed slightly. Two additional herbaria now receive sets in addition to the eleven listed by Korf (1955), *viz.*, BP = Museum of Natural History, Budapest, and FH = Farlow Herbarium, Harvard University, Cambridge. Susan C. Gruff joins Korf as an editor.

Three new combinations are proposed here for species of *Rutstroemia* Karst. *sensu* White: (38) Lanzia longipes (Cke. & Peck *in* Cke.) Dumont & Korf, *comb. nov.* (basionym: *Peziza longipes* Cke. & Peck *in* Cke., Bull. Buffalo Soc. Nat. Sci. 1: 295. 1875); (39) Lanzia luteo-virescens (Rob. *in* Desmaz.) Dumont & Korf, *comb. nov.* (basionym: *Peziza luteo-virescens* Rob. *in* Desmaz., Pl. crypt. France, fasc. 31, *1541*. 1846); (46) Poculum petiolorum (Rob. *in* Desmaz.) Dumont & Korf, *comb. nov.* (basionym: *Peziza petiolorum* Rob. *in* Desmaz., Pl. crypt. France, fasc. 24, *1158.* 1842).

We are particularly happy to be able to issue many collections of historical interest made by earlier Cornell Discomycete workers, Elias J. Durand, Herbert H. Whetzel, W. Lawrence White, etc. In these two fascicles we issue type and authentic materials of several kinds. The holotype materials in CUP that are distributed become isotypes in other herbaria:

ISOTYPES: (26) *Botryotinia calthae,* (33) *Lambertella hicoriae* (issued as *L. corni-maris*), (34) *Lambertella jasmini,* (37) *Coprotinia minutula* (issued as *Lambertella minutula*), (40) *Martininia panamaensis,* (48) *Septotinia podophyllina,* (49) *Sclerotinia smilacinae* (issued as *Stromatinia rapulum*), (50) *Verpatinia calthicola,* and (65) *Jafnea imaii* (issued as *Jafneadelphus ferrugineus* ssp. *imaii*).

ISOPARATYPES: (35) *Lambertella pallidispora* (issued as *L. microspora*), (44) *Sclerotinia longisclerotialis* (issued as *Myriosclerotinia longisclerotialis*).

TOPOTYPE: (47) *Sclerotinia geranii* (issued as *Seaverinia geranii*).

AUTHENTIC: (29) *Ciboria acerina*, (47) *Sclerotinia geranii.*

Taxonomic notes also appear on some of the labels: (36) on an abberrant collection of *Lambertella ? microspora,* (37) on "hairs" in *L. minutula,* (49) on host misidentification of *Sclerotinia smilacinae* and on the date of publication of the combination *Stromatinia rapulum,* (53) on synonymy of *Byssonectria aggregata* and *B. fusispora,* (57) on Korf's previous error in reporting no gel layer in the excipulum of *Cookeina* spp., and (70) on the possible validity of *Geneosperma* as a genus distinct from *Scutellinia.*

## *ACKNOWLEDGEMENTS*

The senior author acknowledges that were it not for the willingness of Susan C. Gruff to assume a major share of the task of issuing these sets, they would still remain awaiting action. We thank the many collectors whose names appear on the labels. Many of the collections were made by the senior author when he was supported by a Cornell University Faculty Research Grant, by the United States Educational (Fulbright) Commission in Japan, and particularly by the research grants awarded him by the National Science Foundation: G-9041 (Discomycete Flora of Asia), G-2339 (Monographic Studies of the Discomycetes), GB-8548 (Monographic and Floristic Studies of the Discomycetes), and DEB75-23557 (Discomycetes of Macaronesia). We are indebted, too, to the curators of herbaria that have lent us specimens used in reaching our taxonomic decisions on the specimens issued here.

## DISCOMYCETES EXSICCATI

DEPARTMENT OF PLANT PATHOLOGY, CORNELL UNIVERSITY
RICHARD P. KORF & SUSAN C. GRUFF, EDITORS

26. *Botryotinia calthae* Hennebert & Elliott *in* Hennebert & Groves, Canad. J. Bot. 41: 343. 1963. ISOTYPE

In swamp, on sclerotia developed in last year's petioles and leaf veins of *Caltha palustris*.

Michigan Hollow, Danby, New York.

Leg: G.L.Hennebert (3094), R.P.K. & students 14.V.1962
Det: G.L.Hennebert

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## DISCOMYCETES EXSICCATI

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27. *Botryotinia squamosa* Viennot-Bourgin, Ann. Inst. Natl. Rech. Agron., Sér. C, Ann. Épiphyt. 4: 38. 1953.

Apothecia produced in growth chamber.

Cornell University, Ithaca, New York.

Leg: R.R.Bergquist 24.V.1967
Det: R.R.B.

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## DISCOMYCETES EXSICCATI

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28. *Botryotinia squamosa* Viennot-Bourgin, Ann. Inst. Natl. Rech. Agron., Sér. C, Ann. Épiphyt. 4: 38. 1953.

Apothecia produced on wheat medium transferred to sterile sand in a growth chamber. Isolated from onion transplants sent from Texas, grown on Long Island, New York.

Cornell University, Ithaca, New York.

Leg: R.R.Bergquist 12.XII.1966
Det: R.R.B.

# DISCOMYCETES EXSICCATI

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29. *Ciboria acerina* Whetzel & Buchwald *in* Groves & Elliott, Canad. J. Bot. 39: 217. 1961. AUTHENTIC

On overwintered male aments of *Acer saccharinum*.

North of Bailey Hall, Cornell University, Ithaca, New York.

Leg: H.H.Whetzel (S1046) *& al.* 5.IV.1934
Det: H.H.W.

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# DISCOMYCETES EXSICCATI

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30. *Ciboria bolaris* (Batsch *ex* Pers. : Fr.) Fuckel, Jahrb. Nassauischen Vereins Naturk. 23-24: 311. 1870.

On twigs of *Carpinus caroliniana*.

Near mouth of Enfield Gorge, Enfield, New York.

Leg: H.H.Whetzel (S557) & C.Westcott 4.V.1928
Det: H.H.W.

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# DISCOMYCETES EXSICCATI

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31. *Ciboria peckiana* (Cooke) Korf f. *peckiana*, Phytologia 21: 203. 1971 [≡ *Rutstroemia macrospora* (Peck) Kan. *in* Wehm. f. *macrospora*].

On very hard wood of a fallen tree.

Slopes of Mt. Gedeh, 1500-1850 m elev., Tjibodas, Java.

Leg: M.A.Rifai & R.P.K. 17.XII.1961
Det: R.P.K.

# DISCOMYCETES EXSICCATI

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32. *Lambertella corni-maris* von Höhnel, Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl., Abt. 1, 127: 375. 1918.

a. On potato-dextrose agar. Cornell University, Ithaca, New York. 1937-1939.
b. On artificially inoculated fruits of *Cornus mas*. XII.1937-III.1938.

From culture sent to Whetzel in 1933 by T.N.Harrison, isolated VIII 1931 from apple collected by T.N.H. near Brig, Switzerland.

Leg: H.H.Whetzel (S1010)
Det: H.H.W.

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# DISCOMYCETES EXSICCATI

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33. *Lambertella corni-maris* von Höhnel, Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl., Abt. 1, 127: 375. 1918 [ISOTYPE of *L. hicoriae* Whetz., Lloydia 6: 33. 1943, *nom. subnud.*].

a. On stromatised hulls of *Carya ovata*.

Wood along east shore, Cayuta Lake, New York.

b. On potato-dextrose agar (harvested 4.III.1939).

Leg: H.H.Whetzel (S1393), W.L.White *& al.* 9.IX.1938
Det: K.P.Dumont

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# DISCOMYCETES EXSICCATI

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34. *Lambertella jasmini* Seaver, Whetzel & Dumont *in* Dumont, Mem. New York Bot. Gard. 22: 75. 1971.
ISOTYPE

On potato-dextrose agar, from fruits of *Jasminum gracile*. Collected by J.M.Waterston in Walsingham, Bermuda, 18.VII. 1941.

Cornell University, Ithaca, New York.

Leg: H.H.Whetzel (S1480) 31.III.1942
Det: H.H.W.

## Discomycetes Exsiccati

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35. *Lambertella microspora* (Seaver) Dumont, Mycologia 66: 1040. 1974. [= *L. pallidispora* Dumont, Mem. New York Bot. Gard. 22: 112. 1971. ISOPARATYPE]

On sheathing base of a palm frond.

Inland from west bank of Rio Mamoré, Bolivia, across river from Abuná, Brazil.

Leg: K.P.Dumont (388), G.T.Prance, L.G.Farias & L.F.Coelho 9.VII.1968
Det: K.P.D.

## Discomycetes Exsiccati

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36. *Lambertella ? microspora* (Seaver) Dumont, Mycologia 66: 1040. 1974.

On leaf blades of *Turpinia formosana*.

Along Bai-bue-tze River, Experimental Forest, Ta-Shui-Che, Chin-Shui-Kou, Taiwan.

NOTES: Dumont (Mem. New York Bot. Gard. 22: 117. 1971) reported this species (as *L. pallidispora* Dumont) from the Philippines. This collection differs somewhat in the lack of distinctive hairs and the enlarged excipular cells recalling *Moellerodiscus*. K.P.D. & R.P.K.

Leg: R.P.K., K.P.Dumont & K.C.Wang 28.III.1966
Det: K.P.D.

## Discomycetes Exsiccati

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37. *Lambertella minutula* (Whetzel) Dumont, Mycologia 67: 320. 1975. ISOTYPE [≡ *Coprotinia minutula* Whetz.]

On dung of some animal.

Woods about north bog, Malloryville, New York.

NOTES: What Dumont *(loc. cit.)* calls "apically free cells" I would term "thick-walled hairs with oily contents." R.P.K.

Leg: H.H.Whetzel (S1538) 22.VI.1942
Det: H.H.W.

## DISCOMYCETES EXSICCATI

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38. *Lanzia longipes* (Cke. & Peck *in* Cke.) Dumont & Korf *in* Korf & Gruff, Mycotaxon 7: 185. 1978.

On petioles of *Fraxinus americana* overwintered on ground.

Coy Glen, Ithaca, New York.

Leg: H.H.Whetzel & W.Lawrence White 22.VIII.1935
Det: R.P.K.

## DISCOMYCETES EXSICCATI

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39. *Lanzia luteo-virescens* (Rob. *in* Desmaz.) Dumont & Korf *in* Korf & Gruff, Mycotaxon 7: 185. 1978.

On petioles and veins of *Acer* sp.

McGowan's Woods, Ithaca, New York.

Leg: K.P.Dumont (137) & J.K.Rogers 16.X.1968
Det: R.P.K.

## DISCOMYCETES EXSICCATI

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40. *Martininia panamaensis* Dumont & Korf, Mycologia 62: 609. 1970 [≡ *Martinia panamaensis* Whetz., *nom. illegit.*]. ISOTYPE

On potato-dextrose agar from Martin's cultures isolated from bark collected by G.W.Martin (4175) about 3 km east of Canal Zone, Arraigán, Panama, on 13.VIII.1937.

Cornell University, Ithaca, New York.

Leg: H.H.Whetzel 4.VI.1942
Det: H.H.W.

## DISCOMYCETES EXSICCATI

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41. *Monilinia seaveri* (Rehm) Honey, Amer. J. Bot. 23: 105. 1936.

On mummified fruits of *Prunus serotina*.

Camp Fortune area, Gatineau Park, Quebec.

Leg: J.W.Groves, Sheila C.Thomson & Lynn K.Arnason (56-35) 15.V.1956
Det: J.W.G.

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## DISCOMYCETES EXSICCATI

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42. *Monilinia vaccinii-corymbosi* (Reade) Honey, Amer. J. Bot. 23: 105. 1936.

On berries of *Vaccinium corymbosum*.

Malloryville, New York.

Leg: E.J.Durand (2250) 11.V.1903
Det: R.P.K.

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## DISCOMYCETES EXSICCATI

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43. *Myriosclerotinia caricis-ampullacea* (Nyberg) Buchwald, Friesia 3: 301. 1947.

On *Carex aquatilis*.

Below Nash Fork Bridge, 9600 ft., University of Wyoming Science Camp, Albany County, Wyoming.

Leg: W.G.Solheim (7318) & R.Solheim 27.VI.1942
Det: W.G.S.

# DISCOMYCETES EXSICCATI

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44. *Myriosclerotinia longisclerotialis* (Whetzel) Buchwald, Kongl. Veterinaer- og Landbohøjskoles Aarsskr. 1949: 156. 1949. ISOPARATYPE

On *Carex prairea.*

Swamp in field southwest of shack, Lloyd-Cornell Preserve, McLean, New York.

Leg: H.H.Whetzel (S312), Westcott & Bodger 24.V.1926
Det: H.H.W.

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# DISCOMYCETES EXSICCATI

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45. *Myriosclerotinia scirpicola* (Rehm) Buchwald, Friesia 3: 296. 1947.

On *Scirpus lacustris.*

Shore of Lyngby Sø, Lyngby Sö, Denmark.

Apothecia collected 3-15.VI.1930; spermodochia 13.VII.1930.

Leg: H.H.Whetzel (E84)
Det: H.H.W.

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# DISCOMYCETES EXSICCATI

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46. *Poculum petiolorum* (Rob. *in* Desmaz.) Dumont & Korf *in* Korf & Gruff, Mycotaxon 7: 185. 1978.

On overwintered leaves of *Quercus alba.*

Road along east side of Cayuta Lake, New York.

Leg: Whetzel, White, Viégas & Thomson 1.IX.1936
Det: W.L.White

## DISCOMYCETES EXSICCATI

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47. *Seaverinia geranii* (Seaver & Shope) Whetz., Mycologia 37: 705. 1945. [AUTHENTIC, TOPOTYPE of *Sclerotinia geranii* Seaver & Shope]

On rootstocks of *Geranium maculatum*.

Van Cortlandt Park, Bronx, New York City, New York.

Leg: H.H.Whetzel (S60), Seaver & Hopkins 1.V.1919
Det: F.J.Seaver

## DISCOMYCETES EXSICCATI

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48. *Septotinia podophyllina* Whetz. *in* Groves & Elliott, Canad. J. Bot. 39: 227. 1961. ISOTYPE

On *Podophyllum peltatum*.

Labrador Lake, New York.

Leg: H.H.Whetzel (S1219), F.L.Drayton *& al.* 5.V.1936
Det: H.H.W.

## DISCOMYCETES EXSICCATI

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49. *Stromatinia rapulum* (Bull. *ex* Mérat : Fr.) Boud., Hist. classific. discomy. Europe, p. 108. 1907. [ISOTYPE of *Sclerotinia smilacinae* E.Durand, Bull. Torrey Bot. Club 29: 462. 1902.]

On dead rootstocks of *Polygonatum* in rich humus.
Fall Creek, Ithaca, New York.

NOTES: Durand *(loc. cit.)* erroneously identified the host as *Smilacina racemosa.* Though the combination *Stromatinia rapulum* is credited to Boudier in synonymy by Rehm (Rabenh., Krypt.-Fl. 1(3)[40]: 823. 1893), and it also is so given on plate 478 and its accompanying list by Boudier (Icon. mycol., livr. 2, IX.1904), the generic name had not been published at those times. *Stromatinia* was only a subgeneric epithet from 1885 to 1907. R.P.K.

Leg: E.J.Durand (1155) 13.V.1901
Det: R.P.K.

## DISCOMYCETES EXSICCATI

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50. *Verpatinia calthicola* Whetzel, Mycologia 37: 692. 1945. ISOTYPE

On overwintered petioles of *Caltha palustris*.

Swamp north of Woods Road, Labrador Lake, New York.

Leg: Whetzel (S1319) & Viégas 23.V.1937
Det: Whetzel & Viégas

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## DISCOMYCETES EXSICCATI

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51. *Anthracobia macrocystis* (Cke.) Boud., Hist. classific. discomy. Europe, p. 65. 1907.

On burned log.

Along road running from Forestry Campus to Mud Springs, Mt. Makiling, Los Baños, Luzon, Philippines.

Leg: K.P.Dumont & G.L.Dumont 27.V.1966
Det: R.P.K.

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## DISCOMYCETES EXSICCATI

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52. *Ascobolus furfuraceus* Pers. *ex* Hook., Fl. scot. 2: 33. 1821. : Fr.

On cow dung.

Pasture near Lloyd-Cornell Preserve, McLean, New York.

Leg: R.P.K. 3.X.1958
Det: R.P.K.

# DISCOMYCETES EXSICCATI

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53. *Byssonectria fusispora* (Berk.) Rogerson & Korf *in* Korf, Phytologia 21: 202. 1971.

On soil under pine.

Cades Cove, Great Smoky Mountains National Park, Tennessee.

NOTES: This specimen has the basal hyphae that Svrček (Česká Myk. 23: 83-96. 1969) uses to distinguish *B. aggregata* (Berk. & Br.) Rogerson & Korf *in* Korf, but presently I accept Rifai's synonymy (Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect., 57(3): 198. 1968). R.P.K.

Leg: T.H.Campbell 26.II.1955
Det: R.P.K.

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# DISCOMYCETES EXSICCATI

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54. *Cheilymenia coprinaria* (Cke.) Boud., Hist. classific. discomy. Europe, p. 63. 1907.

On porcupine dung.

Chaffey's Locks, Ontario.

Leg: R.P.K. 28.IX.1958
Det: R.P.K.

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55. *Cheilymenia theleboloides* (Alb. & Schw. *ex* Pers. : Fr.) Boud., Icon. mycol., livr. 1, pl. 60 [= Tom. 2, pl. 380], 1904.

On cow dung.

Estate of Mr. St. Pierre Du Bose, Chapel Hill, North Carolina.

Leg: W.C.Denison (1674) 7.X.1958
Det: W.C.D.

## Discomycetes Exsiccati

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56. *Cheilymenia theleboloides* (Alb. & Schw. *ex* Pers. : Fr.) Boud., Icon. mycol., livr. 1, pl. 60 [= Tom. 2, pl. 380], 1904.

On cow dung.

Test Gardens, Cornell University, Ithaca, New York.

Leg: M.A.Rosinski, R.A.Shoemaker & R.P.K. 18.VIII.1953
Det: R.P.K.

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## Discomycetes Exsiccati

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57. *Cookeina sulcipes* (Berk.) O. Kuntze, Rev. Gen. Pl. 2: 849. 1891.

On soil.

Finca La Selva, Puerto Viejo, Costa Rica.

NOTES: There is a distinct gel layer in the ectal excipulum. I was clearly wrong (Korf, *in* Ainsworth, G.C. *& al.* [eds.], The Fungi 4A: 265. 1963) in assuming the absence of such a layer in true *Cookeinae*. R.P.K.

Leg: W.C.Denison (1906) 11.VI.1962
Det: W.C.D. & R.P.K.

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## Discomycetes Exsiccati

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58. *Fimaria cervaria* (Phillips *in* Stevenson) Brumm., Persoonia 2: 325. 1962.

On deer dung.

Lost Gorge, Stage 7, Alpine, New York.

Leg: K.P.Dumont & R.P.K. 7.X.1968
Det: R.P.K.

## DISCOMYCETES EXSICCATI

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59. *Helvella acetabulum* (L. *ex* St.-Amans : Fr.) Quél., Enchirid. fung., p. 275. 1886.

On ground in mixed woods.

Queen's University Biological Station, Lake Opinicon, Ontario.

Leg: W.B.Kendrick 9.VI.1963
Det: J.W.Groves

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60. *Helvella macropus* (Pers. *ex* Gray : Fr.) Karst., Not. Sällsk. Fauna Fl. Fenn. Förh. 11: 224. 1870.

On ground among pine needles.

Queen's University Biological Station, Lake Opinicon, Ontario.

Leg: J.W.Groves 12.VII.1961
Det: R.P.K.

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61. *Jafnea fusicarpa* (Gerard) Korf, Nagaoa 7: 5. 1960.

On humus.

Six Mile Creek, Ithaca, New York.

Leg: E.J.Durand (1523) 29.VII.1902
Det: E.J.D.

## DISCOMYCETES EXSICCATI

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62. *Jafnea semitosta* (Berk. & Curt. *in* Berk.) Korf, Nagaoa 7: 5. 1960.

On moist soil.

Fish hatchery on Judd Falls Road, Ithaca, New York.

Leg: F. Kuss & K.P.Dumont 20.IX.1965
Det: R.P.K. & K.P.D.

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## DISCOMYCETES EXSICCATI

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RICHARD P. KORF & SUSAN C. GRUFF, EDITORS

63. *Jafnea semitosta* (Berk. & Curt. *in* Berk.) Korf, Nagaoa 7: 5. 1960.

On sandy loam soil, under fallen leaves.

Kansas University Natural History Reserve, Kansas.

Leg: L.R.Batra (1849) 16.X.1962
Det: L.R.B.

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## DISCOMYCETES EXSICCATI

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64. *Jafneadelphus asperulus* Rifai var. *asperulus*, Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect., 57(3): 91. 1968.

On burnt over ground under *Eucalyptus*.

About seven miles from Carlisle on Colac Road, Australia.

Leg: G.Beaton 1.IX.1968
Det: R.P.K.

## DISCOMYCETES EXSICCATI

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65. *Jafneadelphus ferrugineus* (Phill. *in* Cke.) Rifai ssp. *imaii* (Korf) Rifai, Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect., 57(3): 90. 1968. ISOTYPE of *Jafnea imaii* Korf.

On duff.

Between Kiyomizu Temple and Maruyama Park, Kyoto, Kyoto Pref., Honshu, Japan.

Leg: S.Imai, M.Hamada, T.Hongo & R.P.K. 23.X.1957
Det: R.P.K.

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## DISCOMYCETES EXSICCATI

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66. *Lamprospora macracantha* (Boud.) Seaver, North Am. Cup-Fungi (Oper.), p. 63. 1928, as 'macrantha.'

On soil in woods by road.

Connecticut Hill, near Ithaca, New York.

Leg: W.C.Denison (1208) & family VII.1956
Det: R.P.K. & S.C.G.

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## DISCOMYCETES EXSICCATI

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67. *Lamprospora ovalispora* (Svr. & Kub.) Eckbl., Nytt Mag. Bot. 15: 42. 1968.

On mossy soil.

Mt. Toby State Forest, Massachusetts.

Leg: M.Christensen, J.W.Kimbrough, R.T.Moore & R.P.K. 25.VIII.1963
Det: R.P.K. & S.C.G.

## Discomycetes Exsiccati

Department of Plant Pathology, Cornell University
Richard P. Korf & Susan C. Gruff, Editors

68. *Octospora leucoloma* Hedw. *ex* Gray, Nat. arr. Brit. pl. 1: 667. 1821. : Fr.

On soil among mosses.

Just north of San Andrés at km mark 17.8, Hierro, Canary Islands.

Leg: R.P.K., R.Fogel, G.L.Hennebert & L.M.Kohn 7.I.1977
Det: R.P.K.

## Discomycetes Exsiccati

Department of Plant Pathology, Cornell University
Richard P. Korf & Susan C. Gruff, Editors

69. *Peziza endocarpoides* Berk. *in* Hook. f., Fl. Nov. Zeal. 2: 199. 1855. [= *Plicaria leiocarpa* (Curr.) Boud.]

On soil under needles in *Pinus* woods.

Burn site along road below Poiso, toward Monte, at km mark 10.5 from Funchal, Madeira.

Leg: R.P.K., R.Fogel, G.L.Hennebert & L.M.Kohn 13.I.1977
Det: R.P.K.

## Discomycetes Exsiccati

Department of Plant Pathology, Cornell University
Richard P. Korf & Susan C. Gruff, Editors

70. *Scutellinia geneospora* (Berk.) O. Kuntze, Rev. Gen. Pl. 2: 896. 1891.

On *Cryptomeria japonica* log and on soil.

Woods near railroad at 1000 m elev., Kagoshima-ken, Yaku Island, Japan.

NOTES: This is the type species of *Geneosperma* Rifai (Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect., 57(3): 102. 1968), possibly a good genus. The ascospore follicle is remarkable and deserves EM study! R.P.K.

Leg: Y.Kobayasi, K.Tubaki & R.P.K. 20.X.1961
Det: R.P.K. & Marcelle Le Gal

## DISCOMYCETES EXSICCATI

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71. *Cenangium atropurpureum* Cash & Davidson, Mycologia 32: 734. 1940.

On *Pinus ponderosa*.

Hamilton, Massachusetts.

Leg: P.Spaulding & J.R.Hansbrough 4.VI.1928
(Forest Path. 45641)
Det: R.P.K. & S.C.G.

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## DISCOMYCETES EXSICCATI

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72. *Cenangium ferruginosum* Fr. *ex* Fr., Syst. mycol. 2: 187. 1822.

On *Pinus strobus*.

Hector Land Use area, Lodi, New York.

Leg: R.P.K., L.M.Kohn & M.A.Sherwood 17.V.1975
Det: L.M.K.

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## DISCOMYCETES EXSICCATI

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73. *Phibalis fascicularis* (Alb. & Schw. *ex* Fr.) Wallr., Fl. Crypt. Germ. 2: 447. 1833.

On living *Populus tremuloides*.

Lloyd-Cornell Preserve, McLean, New York.

Leg: Mycology Class 22.V.1961
Det: R.P.K.

# DISCOMYCETES EXSICCATI

DEPARTMENT OF PLANT PATHOLOGY, CORNELL UNIVERSITY
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74. *Phibalis pinastri* (Cke. & Peck *in* Cke.) Korf & Kohn, Mem. New York Bot. Gard. 28: 115. 1976. [≡ *Cenangium acuum* Cke. & Peck *in* Cke. & Ellis]

On needles of *Pinus resinosa*.

Gate Mill, Ohio.

Leg: J.R.Hansbrough (Forest Path. 81737) 29.IV.1936
Det: R.P.K.

# DISCOMYCETES EXSICCATI

DEPARTMENT OF PLANT PATHOLOGY, CORNELL UNIVERSITY
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75. *Phibalis pruinosa* (Ell. & Everh.) Kohn & Korf *in* Korf & Kohn, Mem. New York Bot. Gard. 28: 111. 1976.

On trunk of standing *Populus* cfr. *deltoides*.

Lower Creek Road near Etna, Ithaca, New York.

Leg: L.M.Kohn, R.P.K. & T.Stasz 7.V.1975
Det: L.M.K. & R.P.K.

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MYCOTAXON

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# STUDIES ON DIMARGARITACEAE (MUCORALES) I. TIEGHEMIOMYCES AND DISPIRA FROM INDIA

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## *SUMMARY*

In this first paper of a series on Dimargaritaceae, three species - *Tieghemiomyces parasiticus* Benjamin, *Dispira simplex* Benjamin and *Dispira cornuta* van Tieghem - are reported for the first time from India.

The family Dimargaritaceae was established by Benjamin (1959) to include four genera of merosporangiferous Mucorales: *Spinalia* Vuillemin, *Dimargaris* van Tieghem, *Dispira* van Tieghem and *Tieghemiomyces* Benjamin. At present, one species of *Spinalia,* seven species of *Dimargaris,* three species of *Dispira* and two species of *Tieghemiomyces* are recognized (Benjamin, 1966; Hesseltine and Ellis, 1973). With the exception of *Dispira simplex,* which parasitizes *Chaetomium,* the species included in the Dimargaritaceae are parasites or facultative parasites of other Mucorales. They produce two-spored merosporangia and have septate hyphae with septa containing median plugs. The sporangiophores range from simple to very complex and their morphology forms the basis for the separation of genera. The zygospores, where known, are borne between undifferentiated hyphae and are globose, hyaline and punctate. Of the four genera of Dimargaritaceae, only *Dimargaris* has so far been reported from India (Mehrotra and Baijal, 1963, 1964).

A recent study of the coprophilous Mucorales of Gorakhpur, U.P., has led to the isolation of several members of the Dimargaritaceae. Their occurrence in Gorakhpur is of considerable interest in view of the observation made by Hesseltine and Ellis (1973) that this family, together with the related family Kickxellaceae, may represent geographical isolation in arid regions since most of the species have been found in the Southern California area.

The district of Gorakhpur is situated in the sub-tropical zone and occupies the extreme north-east corner of Uttar Pradesh. It stands in 26°5' and 27°29' north latitude and 83°4' and 84°26' east longitude at a height of about 95 m above sea level. The climate of Gorakhpur is monsoonal having a hot and dry summer, a wet and warm rainy season, followed by a cool winter. The total annual rainfall is about 1,120 mm. The mean relative humidity during rainy, winter and summer seasons is 78, 66 and 49 per cent, respectively.

For the isolation of fungi, samples of mouse dung collected from fields were placed into aseptic moist chambers prepared by moistening several thicknesses of filter paper discs in petri dishes (Benjamin, 1959). The dung pellets were observed frequently for a period of 2 - 3 weeks for the development of desired fungi. Attempts were made to bring the species into pure or two membered culture on Yeast extract soluble starch agar (YpSs: Benjamin, 1959).

In this first paper of a series on species of Dimargaritaceae, one species of *Tieghemiomyces* and two of *Dispira* are reported for the first time from India.

TIEGHEMIOMYCES PARASITICUS Benjamin FIG. 1
Aliso 5: 11. 1961.

Colonies on *Cokeromyces recurvatus* on YpSs dirty white in color. Sporophores erect, septate, 2-3 mm high, with main axis 8-13 μ in diam, each bearing three fertile branches one above the other on the same side immediately below three of the septa at a height of 400-800 μ from the base. Fertile branches lacking sterile prolongations, subverticillately branched, with a main axis bearing one or two series of branchlets arising below the septa; main axis of fertile branches composed of 2-4 superposed cells constricted at their septa, with basal cell 11-23 × 8-14 μ; the ultimate sporiferous branchlets composed of 1-3 superposed cells bearing distal whorls of 2-spored merosporangia. Spores ovoid to ellipsoid, 3.4-4.6 × 2.3-3.0 μ, remaining dry at maturity. Zygospores not seen.

Isolated from mouse dung collected from wheat field, Nagara village, Gorakhpur, U.P., January 1976 (PCM *563*) and December 1977 (PCM *609*). Both isolates showed very restricted growth on *Cokeromyces recurvatus* on YpSs.

*Tieghemiomyces parasiticus* has been known only from the original description, by Benjamin (1961), of an isolate from mouse dung collected in Illinois (U.S.A.).

DISPIRA SIMPLEX Benjamin FIG. 2
Aliso 4: 387. 1959.

Colonies on mouse dung dirty white in color. Sporophores erect, septate, up to 2.5 mm high, with main axis 6-10 μ wide near the middle, bearing 2-4 fertile branches at a height of 600-900 μ from the base. Fertile branches at first several times branched, with each division sympodially branched forming angular axes and having at each node a sterile branchlet, a fertile branchlet and a branch which continues the axis. Sterile branchlets flexuous, simple or 1-septate, 46-70 μ long, 2.3-3.5 μ wide at the base, gradually tapering to 0.5-1.0 μ wide at the tip. Fertile branchlets recurved, 36-46 μ long, 2.3-3.5 μ wide in the middle, bearing at the tip 2-3 sporiferous branchlets formed successively by budding. Sporiferous branchlets not subtended by vesicles, 12-14.5 × 5-7 μ, composed of two slightly ovoidal cells bearing distal whorls of 2-spored merosporangia; the terminal parts of the merosporangia developing by apical budding from the basal. Spores subglobose to ovoid, 3.0-4.0 × 2.3-3.5 μ, remaining dry at maturity. Zygospores not seen.

Isolated from mouse dung collected from groundnut field, Nagara village, Gorakhpur, U.P., February 1976. It could not be brought into pure or two-membered culture on agar media.

*Dispira simplex* was described by Benjamin (1959) from several specimens observed on mouse and rat dung collected from California, and was subsequently shown to be parasitic on *Chaetomium* (Benjamin, 1961). Indoh (1965) reported this species from Japan growing on *Mucor* sp. and *Circinella* sp.

DISPIRA CORNUTA van Tieghem FIG. 3
Ann. Sci. Nat. Bot., Sér. 6, 1: 160. 1875.

Colonies on *Cokeromyces recurvatus* on YpSs white in color. Sporophores erect, septate, up to 5 mm high, bearing 2-5 fertile branches at a height of 2-3 mm from the base. Fertile branches sympodially branched forming spirally coiled main axes bearing laterally 5-14 fertile branchlets and finally terminating in a slender, septate, sterile prolongation 2-3 mm long and 3.0-5.0 μ wide. Fertile branchlets recurved, septate, bearing laterally 1-3 sterile branchlets and terminated by globose fertile heads 27-48 μ in diam. Sterile branchlets recurved or slightly coiled, 40-100 μ long, 2.8-5.7 μ in diam at the base, narrowly attenuated, once or twice septate. Fertile heads composed of globose vesicles 11.4-15.2 μ in diam bearing sporiferous branchlets all over their surface. Sporiferous branchlets 7.0-9.2 × 3.4-4.6 μ, composed of two subequal cells bearing distal whorls of 2-spored merosporangia. Spores elongate-ovoid, 3.4-5.7 × 1.7-2.8 μ. Spore heads remaining dry. Zygospores not seen.

Isolated from mouse dung collected from a wheat field, Nagara village, Gorakhpur, U.P., March 1976 (PCM *564*, = RSA *2173*). The isolate grew well on *Cokeromyces recurvatus* on YpSs. The species was subsequently seen several times on mouse dung collected from various localities of Gorakhpur.

*Dispira cornuta* is known from France (van Tieghem, 1875; Bainier, 1906), England (Elliott, 1926), China (Ou, 1940), Japan (Indoh, 1965), Java (Boedijn, 1958) and North America (Thaxter, 1895; Ayers, 1933, 1935; Benjamin, 1959).

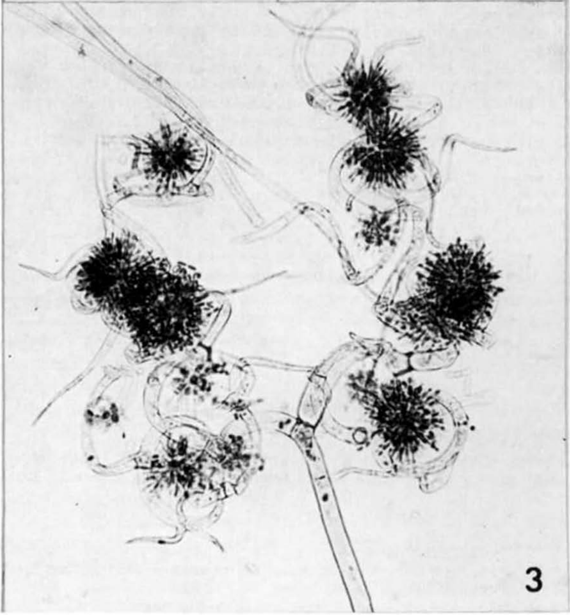
## *ACKNOWLEDGMENTS*

The authors thank Dr. R. K. Benjamin for examining a culture of *Dispira cornuta*, Dr. J. J. Ellis for providing a culture of *Cokeromyces recurvatus*, and Dr. R. W. Embree for reviewing the manuscript. The work

FIG. 1. *Tieghemiomyces parasiticus*, fertile region of sporophore, × 300.
FIG. 2. *Dispira simplex*, a portion of sporophore with two fertile branch systems, × 330.
FIG. 3. *Dispira cornuta*, upper portion of sporophore, × 350.

1

2



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# TYPE STUDIES IN THE GENUS PEZIZA III. OPERCULATE DISCOMYCETES COLLECTED BY W. R. GERARD

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The following is a continuation of my type studies of *Peziza* species. In this article species described by William Ruggles Gerard are discussed, as are collections made by Gerard and described by M. C. Cooke.

I am indebted to the Directors and Curators of the Royal Botanic Gardens, Kew, and the New York Botanical Garden for the loan of specimens.

*Peziza atrovinosa* Cooke, Bull. Buffalo Acad. Sci. *2*: 288. 1875; Mycographia p. 130, fig. 225. 1876. ut "Gerard" ut "Gerard & Cooke," Sacc. Syll. Fung. *8*: 83. 1889.

≡ *Aleurina atrovinosa* (Cooke) Seaver, North American cup-fungi (operculates). p. 101. 1928.
≡ *Galactinia atrovinosa* (Cooke) Le Gal, Bull. Soc. Mycol. France *78*: 207. 1962.
= *Peziza chlamydospora* Ell. & Ev., Bull. Torrey Bot. Club *10*: 98. 1883
[= *Galactinia cristulata* Le Gal, Ann. Sci. Nat. Bot. ser. II, *8*: 98. 1947. a nomen nudum]

Apothecia gregarious to cespitose, medium sized 2.5 - 5 cm, sessile or with a very short stipe. Disc concave, smooth, pale brown or smoky color, when dry, black to blackish brown, sometimes olivaceous. Receptacle saucer-shaped or cupulate, margin entire, sometimes contorted by mutual pressure, outer surface generally black when dry. The excipulum is composed of large subglobose to pyriform cells 10-30 µm diam, these are often and regularly interspersed with septate hyphae 5 - 7 µm in diam; toward the outer surface the cells become angular or compressed and are oriented in a somewhat parallel fashion, cells of the outermost layer elongate to form short hairs which sometimes produce a pustulate appearance. Subhymenium of angular cells. Hymenium about 200 - 230 µm thick. Asci cylindrical, apex blued in Melzer's reagent, 200 - 260 x 10 - 12µm, 8-spored. Ascospores uniserriate, biguttulate, ellipsoidal, at first hyaline and smooth-walled, but soon covered with yellow to brown ridges and warts which anastomose to form an irregular reticulum, in some cases an apiculus develops at each end of the spore. The markings reach a height of 2 µm. Spores 12 - 13 x 7 - 8 µm, excluding markings. Paraphyses rather stout, septate unbranched, yellowish, 3 - 4 µm diam below, apex enlarged to 7 µm.

On soil in woods, sometimes with mosses on wood.

The two descriptions, published within a year of each other are essentially the same. There is some confusion over specimens which should be clarified. In the original description Cooke cites the collection as from Ellis, New Jersey. This he later corrected (Bull. Buffalo Soc. Nat. Sci. *3*: 21. 1875) to state Gerard, New York. Rifai has selected a Gerard specimen in Kew (2227) as lectotype. This specimen is from Poughkeepsie, New York.

*Peziza retiderma* Cooke, also a North American species, is closely related. I have not yet examined the holotype in Kew, however, descriptions by Le Gal (1953) and Rifai (1968) of the species agree with several collections in the Farlow Herbarium. The spores of *P. retiderma* are smaller, tend to be more grossly marked, and more regularly ellipsoid than those of *P. atrovinosa*. It appears to be a species which has tropical affinities. Le Gal described it from Madagascar; Rifai described it from New Zealand.

Also related to these species is a third one *Aleurina stipitata* Cash from Panama (isotype, FH). In *A. stipitata* the spores are also small. They are marked with very large warts which rarely anatomose. Additionally, the apothecium has a short stipe.

*Peziza atrovinosa*, to date, is known only from North America. In Europe *Peziza ostracoderma* Korf has often been confused with *P. atrovinosa*. The two differ in apothecial anatomy and in the form of ornamentation of the ascospores.

64. *Peziza fusicarpa* Gerard, Bull. Torrey Bot. Club *4*: 1873.

≡ *Lachnea fusicarpa* (Gerard) Sacc., Syll. Fung. *8*: 159. 1889.

≡ *Scutellinia fusicarpa* (Gerard) Kuntze, Rev. Gen. Pl. *2*: 869. 1891.

≡ *Macropodia fusicarpa* (Gerard) Durand, J. Mycol. *12*: 29. 1906.

≡ *Jafnea fusicarpa* (Gerard) Korf, Nagaoa *7*: 5. 1960.

This is the type species of the genus *Jafnea*.

*Peziza gerardii* Cooke, Mycographia *1*: 26, fig. 44. 1875.

≡ *Leucoloma gerardii* (Cooke) Lamb., Fl. Mycol. Belg. Suppl. *1*: 318. 1887.
≡ *Humaria gerardii* (Cooke) Sacc., Syll. Fung. *8*: 150. 1889.
≡ *Humarina gerardii* (Cooke) Seav., North American cup-fungi (operculates). p. 138. 1928.
≡ *Galactinia gerardii* (Cooke) Bánhegyi, Borbásia *2*: 150. 1940.
= *Peziza ionella* Quél., Bull. Soc. Bot. France *24*: 328. 1877.
≡ *Aleuria ionella* (Quél.) Gill., Champ. Fr. Discom. p. 51. 1879.
≡ *Humaria ionella* (Quél.) Sacc., Syll. Fung. *8*: 149. 1889.
≡ *Galactinia ionella* (Quél.) Boud., Hist. Class. Discom. d'Eur. p. 47. 1907.
= *Plicaria pedicellata* Velen., Novit. Mycol. p. 198. 1940.

Apothecia occurring abundantly, small, .5 to .7 cm diam, subsessile or with a short stipe. Disc shallowly concave to discoid, smooth, violet when fresh, brownish when dried. Receptacle colored like the disc, shallow cupulate. Excipulum composed entirely of globose to angular cells, 25 - 50 µm in diam; toward the outer surface the cells become smaller, 10 - 15 µm in diam, and occasionally, toward the margin, these smaller outer cells produce short, appressed, hyphoid hairs, 20 - 40 x 10 - 12 µm. These hyphae are septate and blunt at the apex. Hymenium about 250 - 300 µm thick. Asci cylindrical, the apical portion becoming diffusely blue in Melzer's reagent, 230 - 245 x 14 - 16 µm, 8-spored without obvious croziers. Ascospores uniserriate or slightly overlapping, with 1, 2, 3 or many oil guttules, smooth, fusoid, 28 - 32 (-35) x 7 - 9 µm. Paraphyses infrequently septate, unbranched, 3 - 4 µm below, at the apex 5 µm.

On moist ground.

I have followed Svrček (1976) in listing *Plicaria pedicellata* as a synonym.

*Peziza gerardii* cannot easily be confused with other smooth-spored Pezizas. Its large, smooth, fusiform spores, and small, often stipitate, violet apothecia serve to distinguish it. Though rarely collected, it is widely distributed. It is known from Europe and North America where it inhabits moist banks.

The description above is based upon a study of the Gerard specimen at NY and upon a large collection in the von Höhnel Herbarium (FH) under the name *Galactinia ionella.*

*Peziza griseo-rosea* Gerard, Bull. Torrey Bot. Club *6*: 31. 1875; Bull. Buffalo Acad. Sci. *2*: 288. 1875.

This species is apparently not often identified. The color of the hymenium (pale rosy then subochraceous) and the ornamentation and size of the ascospores distinguish it from *Peziza howsei* Boud., with which it might easily be confused. In *P. griseo-rosea* the spores are 14 - 17 x 8 - 11 μm and are ornamented with large, low warts which sometimes anastomose. In contrast, the ascospores of *P. howsei* are larger (19 - 22 x 8 - 11 μm fide Le Gal, 1942) and are marked with fine isolated warts. In both species the spores are biguttulate.

The type, which is not well-preserved, does show that the exciple is composed largely of globose cells and that there are no pustules or warts on the outside. Specimens from North America which I tentatively identify as *Peziza howsei* have well-developed pyrimidal warts on the outer surface. These warts are composed of globose cells.

*Peziza pulchra* Gerard, Bull. Torrey Bot. Club *4*: 64. 1873.

≡ *Geopyxis pulchra* (Gerard) Sacc., Syll. Fung. *8*: 65. 1889.

This is a species of *Geopyxis*. Seaver (1928) placed it in the synonymy of *Geopyxis vulcanalis* (Peck) Sacc.

*Peziza scubalonta* Cooke & Gerard, Grevillea *4*: 92. 1889.

≡ *Lachnea scubalonta* (Cooke & Gerard) Sacc., Syll. Fung. *8*: 179. 1889.

≡ *Scutellinia scubalonta* (Cooke & Gerard) Kuntze, Rev. Gen. Pl. *2*: 869. 1891.

Denison (1964) placed this name in the synonymy of *Cheilymenia stercorea* (Pers. ex Fr.) Boud. a name which Maas Geesteranus (1969) determined was misapplied. He replaced *C. stercorea* with *C. ciliata* (Bull. ex St-Amans) Maas G. *Peziza scubalonta* was synonymized with that species by Maas Geesteranus. I have not reexamined the specimen.

*Peziza truncicomes* Gerard in Cooke, Mycographia *1*: 147, fig. 249. 1876.

This fungus might be tentatively referred to *Peziza ampliata* Pers. ex Pers. It occurs on rotten stumps. The asci are J+. Ascospores are smooth and 13 - 15 x 8 - 9 µm. The flesh seems to be composed of globose cells with no middle layer of interwoven hyphae. Neither Dennis (1968) nor Svrček (1970) seem to resolve the problems of classifying the smooth-spored species of *Peziza*.

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# TYPE STUDIES IN THE GENUS PEZIZA IV. SPECIES DESCRIBED BY F. E. CLEMENTS.

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Under the genera *Peziza* [Dill.] L. ex St-Amans, *Plicaria* Fuckel emend. Boud., *Galactinia* (Cooke) Boud., *Iotidea* Clem., *Podaleuris* Clem., and *Heteroplegma* Clem., F. E. Clements described several species of *Peziza*, principally from Nebraska and Colorado. The identity of these species is discussed in this paper.

The specimens studied were kindly lent by the National Fungus Collection, Beltsville, MD. Several of the type collections have not been located and are presumed lost. Doctors Richard P. Korf and Harold J. Larsen have read the manuscript and have provided important comments.

*Peziza brunneo-vinosa* Clem., Bot. Surv. Nebraska *4*: 8. 1896.

On sand in canyons of the Niobrara River, Keya Paha County, Nebraska. BPI.

Clements reported that the asci did not become blue in iodine but in the type collection there is a faint blue reaction. The spores of *P. brunneo-vinosa* are ornamented with low warts, rather than smooth as reported originally by Clements.

The species seems closest to *Peziza michelii* (Boud.) Dennis in its ascospore ornamentation and hymenial color. Le Gal (1941) noted that there was a violet form found both in Spring and Fall.

*Heteroplegma caeruleum* Clem., Bull. Torrey Bot. Club *30*: 92. 1903.

≡ *Peziza caerulea* (Clem.) Sacc. & D. Sacc., Syll. fung. *18*: 20. 1906, non *P. caerulea* Bolt. ex Fr., Syst. Mycol. *2*: 86. 1822.

Ad terram udam umbrosamque, Dark Cañon, Septembri, 1899. BPI.

This is the type species of the genus *Heteroplegma* Clem. Eckblad (1968) who did not see the specimen suggested that *Heteroplegma* should be regarded as a synonym of *Peziza*. The specimen confirms Eckblad's supposition.

*Heteroplegma caeruleum* shows a unique combination of characters which warrants recognition as a distinct species. Unfortunately, the epithet in *Peziza* is preoccupied. Should another available name for this species not be discovered during these type studies a new name will be necessary. The characteristics of the ascospores, the blue color at the base of the apothecium reported by Clements, and the production of a blue juice when damaged define the species. It may be closely related to *P. saniosa* Fr. ex Shrad. and *P. badio-fusca* (Boud.) Dennis both of which produce blue juice when damaged. However, both of these species produce small apothecia and differ in ascospore size and ornamentation.

To Clements's description, the following supplementary comments may be added: The ascospores are 18 - 20 x 8.5 - 9 µm, obscurely biguttulate, and very finely warted much as in *Peziza badio-confusa* Korf. In some cases the guttules seem to break apart and fill the ascospores with small refractive droplets.

*Plicaria chlorophysa* Clem., Bull. Torrey Bot. Club *30*: 91. 1903.

≡ *Peziza chlorophysa* (Clem.) Sacc. & D. Sacc., Syll. fung. *18*: 18. 1906.

Ad lignum udum vel ustumque, Jack Brook, Augusto. BPI; ad fimum udum, Castle Cañon, Septembri, 1900, FH (lectotype), BPI, issued as no. 123 in *Cryptogamae Formationum Coloradensium*.

When Clements described this species he listed two collections, one from Jack Brook, and one from Castle Cañon. The two collections are identical, and the portion of the Castle Cañon collection in *Cryptogamae Formationum Coloradensium* FH is designated lectotype. It was collected on dung and, despite Clements's original description which records the ascospores as 18 x 11 µm, the ascospores are 20 - 21 x 11 - 12 µm. The collection is composed of small apothecia of *Peziza vesiculosa* [Bull.] ex Fr. The spores are smooth and eguttulate. Unfortunately the excipulum is so poorly preserved in the specimens examined that it is impossible to verify that the excipulum agrees with that found in *P. vesiculosa*.

Seaver (1928) listed this species as a questionable synonym of *Peziza fimeti* (Fuckel) Seaver which, however, has smaller ascospores.

*Heteroplegma crenatum* Clem., Bull. Torrey Bot. Club *30*: 92. 1903.

≡ *Peziza crenata* (Clem.) Sacc. & D. Sacc., Syll. fung. *18*: 19. 1906, non *P. crenata* Pers. ex Mérat, Nouv. Fl. Env., ed 2, *1*: 171. 1821.

Ad terram pinquem udosamque inter moscos, Duxton Brook, Minnehaha, Colorado, Augusto, 1902.

No holotype material of *Heteroplegma crenatum* has been found; however, a later collection was issued in *Cryptogamae Formationum Coloradensium* as number 125. This specimen (Jack Brook 2500m, 22 Aug. 1904) is *Peziza arvernensis* Boud. It does not agree completely with the original description particularly, in that the margin was originally described as crenate and black furfuraceous. In the exsiccata specimen the margin is light and nearly smooth though it is occasionally torn radially. The spores are also smaller in the exsiccata specimen than originally described. Future collections from Colorado might yield specimens which agree with the original description of *H. crenata*. Seaver (1928) listed *H. crenata* as a synonym of *Peziza abietina* Pers. ex Fr. (≡ *Pseudotis abietina* (Pers. ex Fr.) Boud.).

The exsiccata collection is brownish, has eguttulate finely warted ascospores 13 - 16 x 7 - 8 µm. The excipulum is composed of large globose cells, there is a narrow layer of interwoven hyphae, and on the outside there is a layer of loosely interwoven hyphae.

*Peziza elaeodes* Clem., Bot. Surv. Nebraska p. 6. 1901.

On twigs of *Juniperus scopulorum*, Mead's Spring, Brown County, Nebraska, (12102).

I have not been able to locate type or authentic collections of *Peziza elaeodes*. It is described as having small, sessile, convex olivaceous apothecia; the spores are said to be 25 x 10 µm, asperate and apiculate. The description and habitat are suggestive of *Peziza apiculata* Cooke. This is in agreement with Seaver's (1928) conclusion regarding this species.

*Peziza roseo-lilacina* Clem., Bot. Surv. Nebraska p. 7. 1901.

On wet sandy soil, growing among mosses, Barney Creek, Keya Paha County, Nebraska, (12103).

I have been unable to locate any specimen of this species. The description of its color suggests *Peziza griseo-rosea* Gerard, but that species has ornamented ascospores. The spores of *P. roseo-lilacina* were said to be smooth.

*Galactinia viridi-tincta* Clem., Bot. Surv. Nebraska *4*: 9. 1896.

On shady ground, Otowanie Woods, Lancaster County, Nebraska. BPI.

The type specimen is barely mature. Clements described the ascospores as smooth. The few mature ascospores which were seen were ornamented with moderate-sized isolated warts. The spores are 15 - 17 x 7 - 8 µm. Clements reported that the apothecia when injured exude a grayish-green liquid and that the apothecia become greenish when injured. This feature in addition to ascospore size and ornamentation suggests that this species might be identical to *Galactinia succosella* Le Gal and Romagnesi a species I have not yet studied. Should the two prove to be identical the Clements name, being older, would have priority.

*Plicaria vinacea* Clem., Bot. Surv. Nebraska p. 9. 1896.

≡ *Peziza vinacea* (Clem.) Sacc. & Syd., Syll. fung. *14*: 745. 1899, non *Peziza vinacea* Rabenh., Fungi Europ. 2314. 1876.

On damp ground in shady woods, Wabash, Nebraska.

No specimens of this species have been seen. It was said to be rather small, 7 - 15 mm in diam, applanate at maturity and orange-vinous then vinous-brick colored. The spores were reported as smooth, eguttulate, hyaline 16 - 20 x 10 - 12. The asci were J+.

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# A NEW TREMELLA FROM MEXICO

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*Tremella aurantiolutea* Lowy, sp. nov. Figs. 1-2

Fructificatio in humido duro-elastica gelatinosa, circa 4 cm lata, 1.5 cm alta; lobuli solidi, homogenei, imbricati, usque ad 1 mm crassi; marginibus inspissatis, circa 1.5 mm crassis; in superficie superiore laevis, inferiore rugulosa; in sicco aliquantulum contractio, duro coriacea; aurantio-lutea per omnes partes, sed in zona angusta (circa 2 mm lata) pigmentum margine permultum intentus; hymenio amphigeneo, circa 45 µm lata cum basidia conferta; hyphae enodosae; probasidia globosa vel subglobosa, 9-11 µm diam; metabasidia ovoidea vel subpyriforme, cruciatim septata, 12-18 (-20) X 9-11.5 µm; sterigmata matura perangusta, apex amplificatus ad 5 µm diam, cum spiculis brevibus; basidiosporae ovoidae, (7.5-) 8.0-9.0 (-10) µm X 5-6 µm, per repetitionem germinantes vel promycelium promittentes.

Holotype: Mexico. El Mirador, Municipio de Totultla, Est. Veracruz. On dead wood in oak forest, 23-III-1972. Alt. 1000 m. Leg. F. Ventura No. 5429 (ENCB); Isotype (LSUM).

Fructification tough rubbery gelatinous when wet, ± 4 cm broad X 1.5 cm thick, with solid, homogeneous, imbricate lobes ± 1 mm thick, with margins thickened to ± 1.5 mm; superior surface smooth, inferior surface rugulose; drying tough coriaceous, somewhat diminished in size; orange-yellow pigment prominent throughout, with a 2 mm marginal zone bearing deeper orange pigmentation, becoming more intense when soaked, the rest of the fruiting body fading to a lighter hue; hymenium amphigenous, ± 45 µm wide, densely crowded with basidia; hyphae without clamp connections; probasidia spherical to subspherical, 9-11 µm diam; metabasidia becoming ovoid to subpyriform, 12-18 (-20) X 9-11.5 µm,

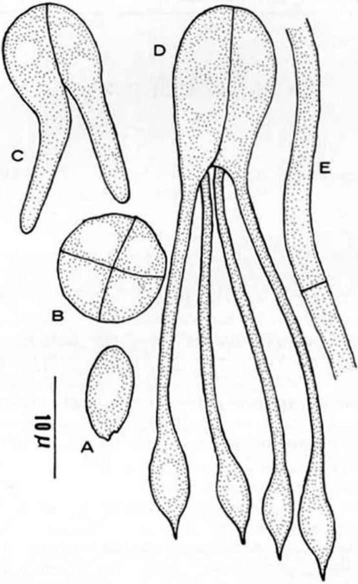

Fig. 1. *Tremella aurantiolutea* Lowy. A, basidiospore; B, apical view of cruciate septate basidium; C, 2-sterigmate developing basidium; D, mature metabasidium with 4 apically enlarged sterigmata, each terminating in a spiculum; E, septate hypha.

Cruciate septate; mature sterigmata narrow cylindrical ± 2 mm diam, apically expanded to form a bulbous to elongate extremity up to 5 μm diam and producing a short spicule; basidiospores ovoid, (7.5-_ 8.0-9.0 (-10) X 5-6 μm germinating by germ tube or by repetition.

Of the 16 species of *Tremella* reported from the neotropics (Lowy, 1971), four are characterized by having reddish to orange or yellow pigments variously distributed in the basidiocarp. These are *T. aurantia* Schw. ex Fries,

Fig. 2. Superior surface of *Tremella aurantiolutea* Lowy. Apx. X 2.

*T. brasiliensis* (Möller) Lloyd, *T. lutescens* Fries, and *T. rubromaculata* Lowy. *T. subrubiginosa* Lowy (1976) was recently described as sharing this macroscopic characteristic, and a sixth species is now added to the list. These brightly pigmented species may easily be separated into two groups, those having solid lobes and those with hollow lobes. *T. aurantia* and *T. subrubiginosa* are solid lobed, as is the new species here described, but in gross morphology, it is the prominently lobed *T. aurantia* that resembles the new species much more closely. The similarity, however, is superficial, since a section through a lobe of *T. aurantia* reveals that it is heterogeneous in composition, consisting of a conspicuous whitish, fleshy fibrous core which can be clearly differentiated upon inspection from the pigmented, amphigenous hymenial layers. By contrast, the lobes of the new species are homogeneous in section, having a tough gelatinous composition throughout. The clamped hyphae and subspherical basidiospores of *T. aurantia* further separate it from the new species, which has clampless hyphae and ovoid basidiospores.

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# A NEW SPECIES OF PANAEOLUS FROM SOUTH AMERICA

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Through the research trips to South America made by the author, one in 1964 and two in 1971, looking for species of *Psilocybe* for the world monograph that he is preparing, he found in Venezuela an interesting undescribed species of *Panaeolus* which here is described as new. The author expresses his thanks to Guggenheim Memorial Foundation of New York for the grant supporting the trips of 1971 to South America. He also thanks Dr. L. Marcano Berti and Dr. E.A. Fábrega both from the University of Los Andes, at Venezuela, for generously hosting the forays in Venezuela, and Dr. D.E. Stuntz and Dr. G.A. Escobar from the University of Washington at Seattle, for critical review of this paper.

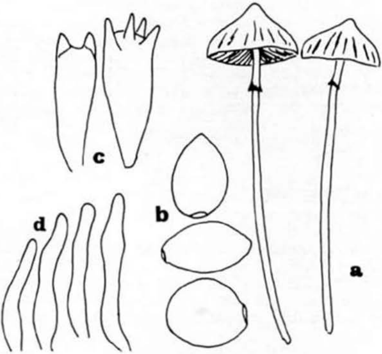
*Panaeolus venezolanus* Guzmán, sp. nov. Figs. a-d

*Pileo 20-35 mm lato, campanulato, brunneo-griseo vel cinereo. Lamellis sinuatis, griseo-atris et maculatis. Stipite 45-50 x 2-3 mm, cylindrato, subbulboso, cavo, rufo-brunneo, pruinoso. Annulo conspicuo, membranaceo vel caduco, nigro. Sporis (11-) 12-14.8 x 8.8-9.9 x 7.7-8.5 um, citriformi - ovatis, nigro-brunneis, poro germinali visibli. Basidiis 2-4-sporis, subcylindratibus. Pleurocystidiis nullis. Cheilocystidiis 24.7-34.5 x 6-9 um, subcylindratibus, hyalinis. Trama hyalina, hyphis cum fibulis. Hyphis pilei subfusiformibus vel subcylindricibus fulvis, 11-49 x 7-11 um. Specie subfimicaria vel fimicaria, gramnicola. Typus: Guzmán 9177 (MER), San Javier del Valle, circa Mérida, Venezuela.*

Pileus 20-35 mm in diam, subcampanulate to campanulate, smooth to irregularly rimose, dry, brownish gray to ashy gray. Lamellae sinuate, blackish-gray but mottled. Stipe 45-50 x 2-3 mm, cylindric but subbulbous, hollow, brownish gray to reddish, pruinose toward the base. Annulus membranaceous, thin, whitish to blackish from spores deposited. Context thin, grayish at pileus, brownish at stipe, with taste and odor slightly farinaceous. Spores (11-) 12-14.8 x 8.8-9.9 x 7.7-8.5 um, limoniform to subovate, with broad germ pore and thick wall, brownish to dark brown or blackish (KOH). Basidia 21.7-30 x 9-11.2 um, two- or four-spored, subcylindric or subpyriform, hyaline. Pleurocystidia none. Cheilocystidia 24.7-34.5 x 6-9 um, hyaline, subcylindric or vesiculose-elongated, abundant. Subhymenium and trama hyaline. Epicutis dry, formed by brownish (KOH) vesiculose-cylindric elements emerging from the surface. Hypodermium hyaline. Clamp connections present but scarce.

Habitat and distribution. Gregarious on cow dung or on rich soils, in meadows of the subtropical forests. Known from Venezuela and possibly also present in subtropical and tropical regions of Mexico.

Studied material. VENEZUELA, N of Mérida, San Javier del Valle, July 27, 1971, Guzmán 9177 (Type, MER; Isotype, ENCB).



Figs. a-d. Panaeolus venezolanus Guzmán. a: Two fruiting bodies. b: Three spores. c: Two basidia. d: Four cheilocystidia (all from the type)

Discussion. The well developed annulus in the adult fruiting bodies is a good feature to separate this species from all others known in the genus. It is rather close to P. sphinctrinus (Fr.) Quél., but the rimose pileus, the size of the spores, and the presence of an annulus separate it from that species. P. sphinctrinus does not have a ring, and the pileus is smooth. Its spores according to Singer (1960) are 12.5-14.5 x 8-10 um; according to Ola'h (1969) are 14.5-18 x 10.5-12.6 um, and according to Kühner & Romagnesi (1953) are 14-18 x 10-12 um. Guzmán and Pérez

Patraca (1972) reported two groups of *P. sphinctrinus* from México, one with spores 12-16.8 x 8.4-12 um and another with spores 14-18.2 x 9.8-13.5 um, and as they mentioned, it seems that there is one *P. sphinctrinus* in tropical and subtropical regions with small spores and another in temperate regions with large spores. *P. venezolanus* is close to that from the tropics and subtropics. The author even had observed some "*P. sphinctrinus*" with an annulus in the tropics of México, but unfortunately he did not study them.

Another species of *Panaeolus* close to *P. venezolanus* is *P. phalaenarum* (Fr.) Quél. sensu Singer (1969), reported from Chile and Europe, which also has a veil that remains as a narrow annular belt, but has spores of 13.5-17 x 5.5-11.5 x 7.7-9.4 um. *P. semiovatus* (Sow ex Fr.) Lund. et Nannf. (= *Anellaria*, Pearson and Dennis), a well known annulate species of the alpine or paramo vegetation, is distinguished from *P. venezolanus* by the white fruiting body as well as by the chrysocystidia and size of the spores.

*P. acuminatus* (Schaeff. ex Sécr.) Quél., *P. antillarum* (Fr.) Dennis, *P. convexulus* Sing., *P. cyanescens* (Berk. & Br.) Sacc., *P. foenisecii* (Pers. ex Fr.) Kühn., *P. moellerianus* Sing., *P. papilionaceous* (Bull. ex Fr.) Quél., *P. retirugis* (Fr.) Gill., *P. rickenii* Hora, *P. sphinctrinus* var. *minor* (Fr.) Sing., *P. subbalteatus* (Berk. & Br.) *P. uliginicola* (Speg.) Sacc., *P. variabilis* Overh., *P. venezolanus*, and the three species discused above, are the known species of *Panaeolus* from South America, according to the revised literature (Dennis, 1970; Restrepo, 1972; Singer, 1960, 1969, and Singer & Digilio, 1951).

This species, together with other *Panaeolus* spp. and *Psilocybe cubensis* (Earle) Sing. is used by the students in Mérida, Venezuela, as a drug that provokes gastrointestinal intoxication, as the author observed in the field and as reported by Llorca Izquierdo (1972).

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# THE SPECIES OF PSILOCYBE KNOWN FROM CENTRAL AND SOUTH AMERICA

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## SUMMARY

There are 66 species of Psilocybe known from Central and South America (excluding Mexico) of which 15 new species, one new combination and 5 new records are discussed. The hallucinogenic species are 30 but 7 are doubtful. Two of the new species described here also grow in the U.S.A. and in Mexico (P. moelleri Guzmán and P. subcubensis Guzmán).

## INTRODUCTION

Central and South America have a very rich mycoflora. Spegazzini (1898, 1919), Rick (1961), Singer (1953, 1959, 1960, 1969, 1973), Singer and Digilio (1951), Singer and Smith (1958), Dennis (1970), and Horak (1967) described numerous agarics, including 45 species of Psilocybe. However further research into this genus would be of great value.

In the present paper I have described 15 new species and one new combination, as well as 5 species are reported here for the first time from Central and South America, but 7 are reported for the first time from several countries of Central and South America. This paper is based on material collected by the author during his trips in 1964, 1971 and 1976 to Colombia, Venezuela, Brazil, Peru, Uruguay and Argentina, as well as on material collected by Spegazzini, Rick, Singer, Horak, and Dumont, deposited in the herbaria LPS, BAFC, PACA, SGO and NY. Microscopic sections of all the specimens were mounted in KOH (5%) and the colors of the spores, hyphae and cystidia are described accordingly. In table 1 the 66 known species of Psilocybe from Central and South America are shown. In table 2 the species described or discussed in the present paper are arranged by countries. In both tables, species marked with an asterisk are hallucinogenic. For practical purposes, species considered are in alphabetic order. This paper is to be considered a precursor of a monograph on Psilocybe in preparation by the author.

## DISCUSSION OF THE NEW RECORDS AND DESCRIPTION OF 15 NEW SPECIES OF PSILOCYBE

### Psilocybe acutipilea (Speg.) Guzmán, new comb.
=Deconica acutipilea Speg., Bol. Acad. Nac. Cs. Córdoba 11: 381. 1889.

Pileus 7-10 mm diam., globose-conic to conic-papillate, smooth to somewhat striate at the margin, hygrophanous (?), brown to brownish, viscid (?). Lamellae subadnate or sinuate, brownish chocolate with whitish edges. Stipe 50 x 1-2 mm, cylindric, hollow, flexuosus, whitish to yellowish, covered by floccose white fibrils (it seems to stain blue when injured). Context whitish; odor and taste unknown.

Spores (7-) 8-9.5 (-11) x 5-6 (-7) x 4-5 µm, subrhomboid in face view, elliptic or subelliptic in side view, thick walled, brownish yellowish, with a broad basal germ pore. Basidia and pleurocystidia not observed (hymenium collapsed) (it is possible that there are no pleurocystidia). Cheilocystidia 15-28 x 5-8 µm, hyaline, abundant, vesiculose-pyriforme with long neck 8-10 x 1-2 µm, forming a more or less sterile band at the edge of the gill. Subhymenium and trama brownish yellowish with hyphae collapsed. Epicutis subgelatinized with hyaline elongated hyphae.

Habitat. Solitary on humus in subtropical forests. known only from the type locality.

Studied material. BRAZIL, Apiaí (Apiahy), Autumm 1881, Spegazzini 1536 (LPS 38307 type).

Discussion. This species is close to P. mexicana Heim and P. caerulescens Murr., and seems to be intermediate between them. The size of the spores and the cheilocystidia serves to separate P. acutipilea from the other two species (see Guzmán 1977-B). It is possible that this species has hallucinogenic properties because of its relationship with those mentioned above that they are use by the Mexican indians as psychotropic fungi.

### Psilocybe aggericola Singer & Smith

This hallucinogenic species was described (Singer & Smith, 1958) from Argentina, Prov. Tucumán, road to Tafí del Valle, near Monumento al Indio, and is only known from the type locality. However the study of the type (Singer T-760, MICH) by the author shows that this species is very close to P. zapotecorum Heim emend. Guzmán, because has spores thin walled and pleurocystidia hyaline to brownish or opaque.

TABLE 1. THE KNOWN SPECIES OF PSILOCYBE FROM CENTRAL AND SOUTH AMERICA AND ITS ECOLOGICAL DISTRIBUTION

| SPECIES | ECOLOGICAL ZONES | | | | COUNTRIES |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | |
| ?* P.ACUTIPILEA (Speg.) Guzmán | X | | | | Brazil |
| * P.AGGERICOLA Sing. & Smith | | X | | | Argentina |
| P.ALNETORUM (Sing.) Sing. | | X | | | Argentina<br>Ecuador |
| P.ANDINA Guzmán | | | | X | Venezuela |
| P.angulata (Pers.) Sing. | | | X | | Chile |
| ?* P.araucana Sing. | | X | | | Argentina |
| P.ARGENTINA (Speg.) Sing. | | X | X | X | Argentina<br>Colombia<br>Venezuela |
| ?* P.BLATTARIOPSIS (Speg.) Sing. | | X | | | Brazil |
| * P.BRASILIENSIS Guzmán | | X | | | Brazil |
| P.bullacea (Bull. ex Fr.) Kumm. | | | | X | Colombia |
| * P.CAERULEOANNULATA Sing. ex Guzmán | | X | | | Brazil<br>Uruguay |
| * P.CAERULESCENS Murr. | | X | | | Panama<br>Venezuela |
| * P.caesioannulata Sing. | | X | | | Chile |
| ?* P.callosa (Fr. ex Fr.) Quél. | | X | | | Chile |

1: Tropical zone; 2: Subtropical zone (with deciduous forests toward the mountains at 1000-2000 m alt.); 3: Temperate zone; 4: Páramos (vegetation of the high mountains). Those fungi marked with an asterisk are hallucinogenic. The species with capitals are discussed in this paper.

Cont. Table 1

| SPECIES | ECOLOGICAL ZONES<br>1 | 2 | 3 | 4 | COUNTRIES |
|---|---|---|---|---|---|
| ?* P. carbonaria Sing. |  | X |  |  | Chile |
| P. chilensis Sing. |  |  | X |  | Chile |
| P. chrysocystidiata Sing. |  | X |  |  | Bolivia |
| * P. COLUMBIANA Guzmán |  |  |  | X | Colombia |
| * P. collybioides Sing. & Smith |  | X |  |  | Argentina |
| P. COPROPHILA (Bull. ex Fr.) Kumm. | X | X | X |  | Ecuador<br>Panama |
| P. cordobensis Sing. |  | X |  |  | Argentina |
| * P. CUBENSIS (Earle) Sing. | X | X |  |  | Argentina<br>Brazil<br>El Salvador<br>Peru<br>Venezuela |
| * P. DUMONTII Sing. ex Guzmán |  | X |  |  | Panama |
| P. dunicola (Speg.) Sing. |  |  | X |  | Argentina |
| * P. FARINACEA Rick ex Guzmán |  | X |  |  | Brazil |
| P. FIMICOLA Guzmán |  |  |  | X | Colombia |
| P. flammuliformis Sing. |  |  | X |  | Chile |
| P. fuegiana (Horak) Sing. |  |  | X |  | Argentina |
| * P. FURTADOANA Guzmán |  | X |  |  | Brazil |
| P. heterosticha (Fr.) Sing. |  |  | X |  | Argentina |
| * P. HOOGSHAGENI Heim |  | X |  |  | Argentina |
| P. HORAKII Guzmán |  | X |  |  | Argentina |
| P. inquilina (Fr. ex Fr.) Bres.<br>= P. ecbola (Fr.) Sing. |  | X | X |  | Argentina<br>Chile<br>Uruguay |
| P. jujuyensis Sing. |  |  | X |  | Argentina |
| P. lazoi Sing. |  |  | X |  | Chile |
| P. marthae Sing. |  |  | X |  | Chile |

Cont. Table 1

| SPECIES | ECOLOGICAL ZONES 1 | 2 | 3 | 4 | COUNTRIES |
|---|---|---|---|---|---|
| *P*. *MERDARIA* (Fr.) Ricken | | X | X | | Argentina<br>Brazil ?<br>Uruguay ?<br>Venezuela |
| *P*. *mesospora* Sing. | | | X | | Argentina |
| *P*. *MOELLERI* Guzmán | | X | X | | Argentina<br>Chile<br>Peru |
| *P*. *MONTANA* (Pers. ex Fr.) Kumm | | | X | X | Chile<br>Colombia<br>Venezuela |
| *P*. *omniumsanctorum* Sing. | | | X | | Argentina<br>Chile |
| *P*. *PANAEOLIFORMIS* Murr. | | | | X | Ecuador |
| * *P*. *paupera* Sing. | | X | | | Brazil |
| *P*. *peladae* Sing. | | | X | | Chile |
| * *P*. *pelliculosa* (Smith) Sing. & Smith (= *P*. *semilanceata* var. *microspora* Sing.) | | | X | | Chile |
| *P*. *peruviana* Sing. | | | X | | Peru |
| * *P*. *PINTONII* Guzmán | | | | X | Colombia |
| * *P*. *plutonia* (B. & C.) Sacc. | | X | | | Venezuela |
| *P*. *praetervisa* Sing. | | | X | | Argentina |
| *P*. *pteridophytorum* Sing. | | X | | | Argentina |
| ?* *P*. *sclerotifera* (Speg.) Sing. | | X | | | Argentina |
| * *P*. *semilanceata* (Secr. ex Fr.) Kumm. | | X | | | Chile |
| *P*. *septembris* (Sing.) Sing. | | | X | | Chile |
| * *P*. *sierrae* Sing. | | X | | | Chile |
| *P*. *squarrosipes* Sing. | | X | | | Argentina |

Cont. Table 1

| | SPECIES | ECOLOGICAL ZONES | | | | COUNTRIES |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | |
| | *P*. *subcoprophila* (Britz.) Sacc. | | | X | | Argentina<br>Chile |
| * | *P*. *SUBCUBENSIS* Guzmán | X | X | | | Mexico<br>Colombia<br>Honduras<br>Bolivia<br>Ecuador<br>Venezuela |
| | *P*. *subhyperella* Sing. | | X | | | Colombia |
| * | *P*. *SUBYUNGENSIS* Guzmán | | X | | | Venezuela |
| | *P*. *TORTIPES* Speg. (= *Naematoloma* *tortipes* (Speg.) Guzmán) | | X | | | Argentina |
| ?* | *P*. *URUGUAYENSIS* Sing. ex Guzmán | | | X | | Uruguay |
| | *P*. *valdiviensis* Sing. | | | X | | Chile |
| | *P*. *venezuelana* Dennis | | X | | | Venezuela |
| * | *P*. *WRIGHTII* Guzmán | | X | | | Argentina |
| * | *P*. *YUNGENSIS* Sing. & Smith = *P*. *yungensis* var. *diconica* Sing. & Smith | | X | | | Bolivia |
| * | *P*. *zapotecorum* Heim emend. Guzmán | | X | | | Brazil<br>Peru |

TABLE 2

## DISTRIBUTION BY COUNTRIES OF THE SPECIES OF PSILOCYBE DISCUSSED IN THIS PAPER

HONDURAS
* _P. subcubensis_ Guzmán
PANAMA
* _P. caerulescens_ Murr.
_P. coprophila_ (Bull. ex Fr.) Kumm.
* _P. dumontii_ Sing. ex Guzmán
COLOMBIA
_P. argentina_ (Speg.) Sing.
_P. bullacea_ (Bull. ex Fr.) Kumm.
* _P. columbiana_ Guzmán
_P. fimicola_ Guzmán
_P. montana_ (Pers. ex Fr.) Kumm.
* _P. pintonii_ Guzmán
* _P. subcubensis_ Guzmán
VENEZUELA
_P. andina_ Guzmán
_P. argentina_ (Speg.) Sing.
* _P. caerulescens_ Murr.
_P. merdaria_ (Fr.) Ricken
_P. montana_ (Pers. ex Fr.) Kumm.
* _P. subcubensis_ Guzmán
* _P. subyungensis_ Guzmán
ECUADOR
_P. alnetorum_ (Sing.) Sing.
_P. coprophila_ (Bull. ex Fr.) Kumm.
_P. panaeoliformis_ Murr.
* _P. subcubensis_ Guzmán
PERU
_P. moelleri_ Guzmán
* _P. zapotecorum_ Heim
BOLIVIA
* _P. subcubensis_ Guzmán
* _P. yungensis_ Sing. & Smith
BRAZIL
?* _P. acutipilea_ (Speg.) Guzmán
* _P. brasiliensis_ Guzmán
* _P. caeruleoannulata_ Sing. ex Guzmán
* _P. cubensis_ (Earle) Sing.
* _P. farinacea_ Rick ex Guzmán
* _P. furtadoana_ Guzmán
_P. merdaria_ (Fr.) Ricken ?
* _P. zapotecorum_ Heim
URUGUAY
* _P. caeruleoannulata_ Sing. ex Guzmán
_P. merdaria_ (Fr.) Ricken ?
?* _P. uruguayensis_ Sing. ex Guzmán
CHILE
_P. moelleri_ Guzmán
_P. montana_ (Pers. ex Fr.) Kumm.

ARGENTINA
* *P. aggericola* Sing. & Smith
  *P. alnetorum* (Sing.) Sing.
  *P. argentina* (Speg.) Sing.
  *P. blattariopsis* (Speg.) Sing.
* *P. cubensis* (Earle) Sing.
* *P. hoogshageni* Heim
  *P. horakii* Guzmán
  *P. merdaria* (Fr.) Ricken
  *P. moelleri* Guzmán
  *P. tortipes* Speg.
    = *Naematoloma tortipes* (Speg.) Guzmán
* *P. wrightii* Guzmán

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### *Psilocybe alnetorum* (Sing.) Sing.

This species was known previously only from Argentina (Singer & Digilio, 1951; Singer 1959). The author identified the species in material from ECUADOR: 36 km from Quito, road to Tandayapa, Prov. Pichincha, at 2400 m elevation on bamboo culm: Dumont EC-2297, Aug. 6, 1975 (NY). The Ecuatorian material agrees well with the type (BAFC). The spores are (5.5-) 6-7 (-8) x 4.4-5 x 3.8-4.4 µm, pleurocystidia 22-39 x 7.7-12 µm, mucronate, hyaline but sometimes with a refringent central mass, and with hyaline cheilocystidia 13-19 x 5-7.7 µm, fusiform or short mucronate. The fruit body is collybioid, 5-10 mm in diameter.

### *Psilocybe andina* Guzmán, sp. nov.

*A Psilocybe montana differt praesentia annuli in maturis, Ad terram muscosam in paramo. Sierra Nevada de Santo Domingo, Laguna de Mucubaji, VENEZUELA, Guzmán 9232 (MER) typus*.

Pileus 5-10 mm diam., convex or subcampanulate, smooth, slightly striate, transparent at the margin when wet, subviscid or lubricous to dry; hygrophanous, reddish brown, fading to brownish or clay color or straw color. Lamellae broadly adnate to somewhat decurrent, brownish to brown-violet with edges concolorous or whitish and floccose. Stipe 20-30 x 0.5-1.5 mm, cylindrical or attenuate towards the apex, hollow, whitish above to reddish brown below, finally all over covered with fibrillose of floccose white spots. Annulus well developed, whitish, membranous to fibrillose or floccose. Context thin, yellowish, without any taste or odor. Spore print dark violaceous brown.

Spores (6.6-) 7.7-8.8 (-9.9) x 5-5.5 (-6) x 3.3-5 µm, subrhomboid or sublentiform in face view, ellipsoid or ovoid-ellipsoid in side view, with thick wall, brownish or yellowish brown and broad germ pore. Basidia 16-22 x 6-7 µm, two or four-spored, vesiculose or subpyriform. Pleurocystidia none. Cheilocystidia 15-30 x 4.4-5.5 µm, ampullaceous with long neck 2-3.3 µm diam., hyaline, abundant; sometimes with an oil drop at the apex. Subhymenium formed by subglobose hyaline elements, strongly irregularly incrusted with brown yellow pigment on the walls. Trama regular, hyaline or brownish, incrusted with scarce pigment. Epicutis subgelatinized, formed by elongated, thin, hyaline to brownish hyphae. Hypodermium like as the subhymenium. Clamp connections present.

Habitat. Gregarious on soil covered by mosses (Polytrichum), in páramos with Espeletia at 3600 m elevation. Known only from the type locality.

Studied material. VENEZUELA, Parque Nacional Sierra Nevada de Santo Domingo, Laguna de Mucubaji, Jul. 28, 1971, Guzmán 9232 (MER Holotype, ENCB Isotype).

Discussion. The well developed annulus in the adult carpophores is the principal feature distinguishing this species from P. montana, a very closely related species. It is interesting to observe that P. montana grows more frequently in lower and warmer lands than P. andina. Thus it seems that the well developed veil helps to protect the hymenium in the young stages. The same observation can be made for Panaeolus semiovatus (Sow. ex Fr.) Lund ex Nannf. and P. antillarum (Fr.) Dennis, the first with annulus and characteristic of the high mountains and the latter without annulus and only common in tropical and subtropical regions.

## Psilocybe argentina (Speg.) Sing.

This coprophilous species was until recently known only from Argentina (Singer, 1969). It occurs in the south of Argentina and in the high mountains of Mexico (Guzmán et al., 1977). It differs from P. coprophila (Bull. ex Fr.) Quél. only in the size of the spores. P. argentina has spores (11-) 12-15 (-16) µm long, as the author observed in the type (LPS) and in the material from Venezuela and Colombia from where it is here reported for the first time.

Studied material. VENEZUELA, Parque Nacional Sierra Nevada, Teleferico de Mérida, Station La Aguada, July 29, 1971, 3200-3400 m elevation, páramo with Espeletia: Guzmán 9245 (MER). COLOMBIA, Dept. Boyacá, road between Aquitamia and the crossing of Sogamoso to Aguazul, June 12, 1976: Dumont CO-4951 (NY). Road Choconta to Aguaclara, June 10, 1976, 1400 m elevation; Dumont CO-4600 (NY). Dept. Chocó, near Ansermanuevo, road to San José del Palmar, Aug. 27, 1976, 1900 m elevation: Dumont CO-7451 (NY).

### *Psilocybe blattariopsis* (Speg.) Sing.

This species described by Spegazzini as *Pholiotella blattariopsis* Speg. from Brazil (Apiaí), and only known from the type locality, has brownish pleurocystidia (in KOH), according to the study of the type (Puiggari 1535,LPS 1333), feature not considered by Singer (1950). It is close to *P. subaeruginosa* Clel. from Australia and to *P. uspanapensis* Guzmán from Mexico for the brownish pleurocystidia, but the spores are subrhomboid, (8.4-) 9.6-10.8 (-13.2) x (6.6-) 7.2-9.6 (-10) x 5.5-7.2 µm, with thick wall, like to those of *P. uruguayensis* Sing. ex Guzmán.

### *Psilocybe brasiliensis* Guzmán, sp. nov.

*Pileo 12-30 mm lato, convexo vel conico vel campanulato, hygrophano, rufobrunneo vel alutaceo. Lamellis adnatis fuscosapiaceis. Stipite 35-80 x 1-4 mm, carneo-albido dein cum pileo subconcolori, basi strigosissima. Carne caerulescente, odore farinaceo. Sporis (5.6-) 6.6-7.1 (-7.7) x 4.9-5.5 (-6) x 4.2-5 µm, sublentiformibus. Pleurocystidiis 22-29 x 8.8-12 µm, hyalinis, vesiculose fusiformibus vel sublageniformibus. Cheilocystidiis 9.6-13.2 x 4.8-7.2 µm, lageniformis. Epicute subgelatinascente. Ad terram in silvis Araucariae et Podocarpi. Parque Forestal del Estado Sao Paulo, Brasil, Guzmán 8920 (SP), Typus.*

Pileus 12-30 mm diam., convex or conical to subcampanulate, smooth, striate toward the margin when moist,lubricous, hygrophanous, reddish brown to alutaceous. Lamellae adnate or subadnate, brownish to fuscous sepia, with whitish edges. Stipe 35-80 x 1-4 mm, cylindrical or rarely subbulbous, whitish to almost concolorous with pileus, hollow, covered toward the base with whitish fibrils of the veil, sometime with a rhizomorphic prolongation. Veil white, fugacious on pileus, but sometimes persistent on the upper part of the stipe as a white floccose annular zone. Context whitish and fleshy in pileus, reddish brown and fibrous-hard in the stipe; odor and taste farinaceous, readily staining blue when injured, but only slightly so in the stipe. KOH stains all parts yellow-brown. Spore print dark grayish violet.

Spores (5.6-) 6.6-7.1 (-7.7) x 4.9-5.5 (-6) x 4.2-5 µm, subrhomboid in frontal view or subelliptic in lateral view, yellowish brown, smooth, thick walled, with a broad germ pore. Basidia 18-27 x 6.6-8.4 µm, four-spored, hyaline, subvesiculose. Pleurocystidia 22-29 x 8.8-12 µm, hyaline, vesiculose, fusoid or sublageniform. Cheilocystidia 9.6-13.2 x 4.8-7.2 µm, forming a sterile band at the edge of the gill, hyaline, lageniform. Subhymenium arranged by globose subhyaline elements with a reddish brown to gray blue pigment. Trama regular, hyaline or yellowish with elongated hyphae 4-10 µm diam., thin walled (wall 0.5-1 µm thick), with clamps. Epicutis a cutis more or less gelatinized, with brownish, parallel, thin hyphae. Hypodermium hyaline or yellowish with parallel elongated hyphae 5-13 µm diam., thin walled.

Habitat. Gregarious on grassy soil (*Anonopus compressus*) in forest of *Araucaria brasiliana* and *Podocarpus*. Known only from the type locality.

Studied material. BRAZIL, Parque Forestal del Estado de Sao Paulo, 10-13 km E of Campus de Jardao, near Rio Sapucaiguasu, 1500 m elevation, March 8, 1971, Guzmán 8920 (holotype SP, Isotype ENCB); other collections from the same locality are Guzmán 8922 & 8929 in ENCB and SP.

Discussion. This species is close to *P. caerulescens*, but the thin and long stipe, the rhizomorphic base, as well as the form and size of the pleurocystidia and cheilocystidia are well defined features which separate it. Its bluing as well as its odor and favor, indicate that this species has hallucinogenic propierties.

### *Psilocybe bullacea* (Bull. ex Fr.) Kummer

This species had been interpreted by several authors in different ways. It is close to *P. montana* (Pers. ex Fr.) Kumm. and *P. coprophila* (Bull. ex Fr.) Kumm., but differs from the first in having a well developed veil which sometimes forms an ephemerous annulus, in having floccose stipe, in growing on rich soil or on dung an in presenting a hyaline or slightly pigmented subhymenium, as the author has observed when studying European collections. With *P. coprophila* differs in the size of the spores (see *P. coprophila* in this paper). The first South America report of *P. bullacea* is from COLOMBIA: Dumont CO-5037 (NY), on rich soil or dung, road Sogamoso-Aguazul, intersection with Alquitama road, Dept. Boyaca, June 13, 1976. This material has spores (5.5-) 6-7.1 (-8) x 4.5-6 x 3.8-4.4 µm, yellowish brown, subhexagonal, with cheilocystidia lageniform forming a sterile band at the edge of the gill, 20-33 x 5-6 um, with a long neck 1.5-2.5 µm across; there are no pleurocystidia. The fruit bodies are small (pileus no more than 10 mm diam.) with broad, adnate lamellae.

### *Psilocybe caeruleoannulata* Sing. ex Guzmán
= *Stropharia siccipes* Karst. var. *lugubris* Rick, Lilloa 4:83, 1939

*Pileo 19-22 mm lato, convexo vel conico, papillato, hygrophano, rufobrunneo vel alutaceo. Lamellis sinuato-adnatis, glaucis. Stipite 25-45 x 1-2 mm, carneo-albido vel fulvo. Annulo conspicuo, membranaceo, albo, caerulescente, caduco. Carne subcaerulescente, odore leniter farinaceo. Sporis (8.8-) 9.9-11 (-12) x 6-6.6 (-7.1) x 5.5-6 µm, sub-*

*rhomboideis. Pleurocystidiis nullis. Cheilocystidiis 17-20 x 5-6 µm, lageniformis. Epicute gelatinascente. Ad terram, graminicola aut in paludosi, extra silva. Maldonado, Uruguay, Singer B-4172 (BAFC), typus.*

Pileus 10-22 mm diam., convex or conical to papillate, smooth, transparently striate at the margin when moist, viscid, hygrophanous, reddish brown to faded sordid pallid chamois with brownish buff to alutaceous center; pellicle separable. Lamellae sinuate-adnate or subadnate, grayish violet but with whitish edges when young. Stipe 25-45 x 1-2 mm, whitish from a silky appressed covering over a gray background, becoming grayish cinereous where touched; at base soon caesious, slightly and gradually tapering upwards. Veil well formed; annulus membranous but thin, smooth, white, slightly staining blue, fragile but usually persistent. Context pallid in pileus, grayish to brownish in stipe; odor none or slightly farinaceous; taste slightly farinaceous. Spore print deep violaceous.

Spores (8.8-) 9.9-11 (-12) x 6-6.6 (-7.1) x 5.5-6 µm, subrhomboid frontally, subelliptic in profile, yellowish brown, smooth, more or less thin walled but with complex wall and with broad truncate germ pore. Basidia 15-22.4 x 7.5-9.8 µm, four-spored, hyaline, subvesiculose. Pleurocystidia none. Cheilocystidia 17-20 x 5-6 µm, forming a sterile band on the edge of the gill, hyaline, lageniform or vesiculose-ventricose, the neck 5-8.5 x 1-2 µm, sometimes with an oily hyaline drop at the apex. Subhymenium with parallel, brownish, thin (4 µm diam.) hyphae. Trama regular, brownish or hyaline, with chestnut incrusted hyphae, 12-20 µm diam., thin walled. Clamp connections present. Hypodermium with interwoven brownish hyphae which are broader on the average than those of the epicutis, not subcellular, but in the context below often more pigmented and darker, more irregular and with quite a few rather short elements. Epicutis hyaline, a 50-60 µm thick layer of strongly gelatinized hyaline, filamentous hyphae 0.5-2.2 µm thick.

Habitat. On marshy ground or in grasslands outside the forests of *Araucaria* and *Podocarpus*, in pasture land, sometimes on dung. Known from Brazil and Uruguay.

Studied material. BRAZIL, State of Sao Paulo, near Campos de Jardao, March 8, 1971, 1600 m elevation, Guzmán 8877 (ENCB; SP). Guzmán 8916 (ENCB; SP). Santa María, 1936, Rick (PACA 15234, Type of *Stropharia siccipes* var. *lugubris* Rick). Sao Leopoldo, 1934, Rick (PACA 9362, as *Stropharia inuncta*). Without locality: Rick (Herb. Bresadola 287; NY, as *Stropharia luteonitens*). URUGUAY, Maldonado, May 27, 1966, Singer B-4172 (BAFC Holotype).

Discussion. *P. caeruleoannulata* is close to *P. stuntzii* Guzmán & Ott and *P. uruguayensis* Sing. ex Guzmán, but differs in the shorter cheilocystidia (*P. stuntzii* has cheilocystidia 22-27.5 µm long and *P. uruguayensis* 24.5-32 µm long). This species was named by Singer in the herbarium BAFC based on the collection from Uruguay. Later the author of the present paper collected the same fungus in Brazil and found the species in the herbarium PACA as *Stropharia siccipes* Karst. var. *lugubris* Rick, a variety described in 1939 but not considered in Rick's later papers (1961); this material agrees well with the type of *P. caeruleoannulata*; the variety of Rick is considered synonymous. Bresadola confused *P. caeruleannulata* with *P. luteonitens* (Vahl ex Fr.) Parker-Rhodes, as the author noted in one of Rick's collections (NY), identified by Bresadola as *P. luteonitens*, but this species has spores 15.4-18.7 (-20) x 11-13.2 x 9.9-11 µm.

### *Psilocybe caerulescens* Murr.

This well known hallucinogenic species, described from Alabama, U.S.A., and reported from Mexico (Heim & Wasson, 1958 and Singer & Smith, 1958) is here reported for first time from Panama and Venezuela. The Central and South American collections agree well with the type (NY). They were collected on orange reddish clay soil similar to the Mexican localities. The spores are subrhomboid or elliptic, (5.5-) 6-7 (-7.7) x (4.4-) 4.5-5.5 (-5.8) x 4-4.5 µm, pleurocystidia absent, cheilocystidia lageniform or filamentous, 12-20 x 3-4.4 (-5.5) µm; the carpophore is strong caerulescent, even in the hyphae of the subhymenium which are blue green in KOH.

Studied material. PANAMA, Prov. Veragas, Santa Fe to Calovibora, atlantic slope, vicinity Rio Caloviborita, June 18, 1975. Dumont PA-570 (NY). VENEZUELA, State of Sucre, Mundo Nuevo to Mancal road, NW of Irapa, July 7, 1972, Dumont VE-4145 (NY).

*P. caerulescens* is close to *P. wrightii* Guzmán and *P. farinacea* Rick ex Guzmán (see discussion under these species).

### *Psilocybe columbiana* Guzmán, sp. nov.

*Pileo 6-19 mm lato convexo vel campanulato, hygrophano, rufobrunneo vel fulvo vel albolutescente. Lamellis adnatis, ochraceo-violacei. Stipite 20-60 x 1-3 mm, clarobrunneo, fibrilloso vel fulvo. Annulo nullo. Carne caerulescente, odore et sapore farinaceis. Sporis (6.6-) 7.1-8.8 x (4.9-) 6-6.6 (-7.1) x 4.4-5.5 µm, sublentiformibus vel elongato-ellipsoideis. Pleurocystidiis nullis. Cheilocystidiis 22-30 x 3.3-6.5 µm, lageniformibus. Epicute subgelatinascente. Ad terram argillaceam expers herbis destitutam in paramo. Espeletiae grandifoliae. Represa del Rio Neusa-Torre de Transmision de TV, Municipio Tansa, Cundinamarca, Colombia, Guzmán 9146 (COL) typus.*

Pileus 6-19 mm diam., convex to campanulate, smooth to slightly rimose, faintly striate and transparently when moist, lubricous, hygrophanous, brown reddish to yellow reddish, finally yellow whitish. Lamellae adnate or subadnate, ochre violaceous, with whitish edges. Stipe 20-60 x 1-3 um, cylindrical, sometimes sinuous, hollow, white to brown reddish, covered with floccose white fibrils, sometimes with a rhizomorphic white prolongation in the soil, up to 20 mm long. Veil white and floccose, distinct annulus absent. Context white in pileus, concolorous with pileus in stipe, staining blue when cut. Odor and taste farinaceous. Spore print violet brown to almost black.

Spores (6.6-) 7.1-8.8 x (4.9-) 6-6.6 (-7.1) x 4.4-5.5 µm, subrhomboid in frontal view, subelliptic in lateral view, light brownish chocolate or yellowish brown, smooth, thin walled, with a broad germ pore. Basidia 15-27 x 4.4-8 µm, four-spored, hyaline, vesiculose or subpyriform. Pleurocystidia none. Cheilocystidia 22-30 x 3.3-6.5 µm, abundant, forming a sterile band at the edge of the gills, hyaline, lageniform or fusoid-ampullaceous and mucronate, sometimes branched; the neck 1.6-2.2 µm across. Subhymenium formed by subglobose, subhyaline elements with yellowish brown irregularly incrusting pigment. Trama regular, hyaline, with elongate hyphae 15-25 µm diam. with thin wall (1.5 µm thick). Epicutis subgelatinized, with brownish or hyaline hyphae 2-6 µm broad. Clamp connections present.

Habitat. On clay black soils without herbaceous vegetation, sometimes living together with Aleuria aurantia (Pers. ex Fr.) Fuck., in páramos of Espeletia argentea at 3300-3500 m elevation. Known only from the type locality.

Studied material. COLOMBIA, Department of Cundinamarca, Municipio of Tansa, road La Represa del Río Neusa to la Torre de Transmisión de TV, July 24, 1971. Guzmán 9146 (Holotype COL; Isotype ENCB); other collections from the same locality are Guzmán 9145. 9156; 9158 (all in ENCB and COL).

Discussion. P. columbiana belongs to the P. zapotecorum group because of its spores and floccose stipe, but differs in the size of the spores and form of the cheilocystidia. It is a hallucinogenic species since it stains blue and has a farinaceous taste and odor.

## Psilocybe coprophila (Bull. ex Fr.) Kumm.

This common non-hallucinogenic species, with spores of (9-) 10-12 (-14) x (6-) 7-9 x 6-7.1 µm, is here reported for the first time from Ecuador and Panama. It is close to P. argentina (Speg.) Sing. and P. panaeoliformis Murr. See discussion of these.

Studied material. ECUADOR, road to Loja, 12 km from Zamora, Aug. 1, 1975, Dumont EC-1886 (NY). PANAMA, Prov. Chiriqui, road El Alto del Volcan to Cerro Punta, near Aguacate, July 4, 1975, Dumont PA-2117 (NY).

### Psilocybe cubensis (Earle) Sing.

The type (Earle 109, NY) of this hallucinogenic mushroom has spores (12-) 13.2-15.4 (-17.6) x 7.7-9.9 (-11) x 7-8.8 µm and sometimes up to 19 um long. But Singer & Smith (1958) reported for this species spores 11.5-17.3 x 8-11.5 x 7-9 µm and Heim (in Heim & Wasson, 1958) 11.8-15 x 8.8-10 x 7.8-8.8 µm for Mexican materials and 13-16.2 µm, 13-18 um, 12.5-15.8 µm, and 12-16 um long for Asiatic materials. All the Mexican materials studied by the present author have spores (9.9) 11-13 (-14) x 7.7-8.8 x 6.6-7.1 µm, and so have some materials from Colombia, Ecuador and Venezuela. Thus, there are two groups of fungi, one with large spores as the type, the other with small spores. The author considers the group of fungi with small spores to belong to another species, that here is described as new (see P. subcubensis Guzmán below). On the other hand the types of Naematoloma caerulescens Pat. from Indochina (FH) and Stropharia cyanescens Murr. from Florida, U.S.A. (NY) have large spores as does the type of P. cubensis; these species are considered to be synonyms of P. cubensis following Singer & Smith (1958).

It is interesting to observe that while the group of fungi with the large spores grows in subtropical or northern localities, the group of fungi with the smaller spores grows in the tropics of subtropics near the equator, an observation that agrees with that discussed by the author (Guzmán, 1977-A; 1978) in regards to other species of Psilocybe (P. uspanapensis Guzmán, P. singeri Guzmán, P. weldeni Guzmán, and others), which only grow in the tropical rain forest and have very small spores in comparation with P. aztecorum Heim, P. baeocystis Sing. & Smith, P. cyanescens Wakef. wich have large spores and grow only in high mountains of Mexico (the first) and in the NW of U.S.A. (the others).

Material studied. BRAZIL, Rio Grande do Sul, Itacolomi, Gravatai, March 2, 1971, Guzmán 8828 (ENCB); Santa Maria, 1935, Rick 9376 (FH, PACA 15227 Type of Stropharia subcyanescens Rick)*. ARGENTINA, Buenos Aires Region, Punta Lara, Sept. 21, 1960, Singer S-192 (BAFC)**.

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* Material first studied by Singer (1953), who considered Rick's specimens as neotype of S. subcyanescens and synonymous with Psilocybe cubensis.

** Reported by Singer (1960).

### *Psilocybe dumontii* Sing. ex Guzmán, sp. nov.

*A Psilocybi yungensi affini differt cheilocystidiis, 11-18 (-26) x 3.3-6 (-7.7) µm, hyalinis vel subbrunneis. Lignicola, Cerro Punta, Chiriqui, Panama, Dumont PA-2074 (NY) typus*.

Pileus 8-15 mm diam., conical, papillate, smooth, but striate toward the margin, hygrophanous, brown to yellowish brown, subviscid or lubricous to dry. Lamellae adnate, very thin, dark violaceous brown. Stipe 25-35 x 1-1.5 mm, cylindrical, somewhat bulbous, hollow, whitish to reddish brown, densely covered by floccose, white fibrils of velar origin. Veil inconspicuous in the adult carpophores. Context whitish, staining blue to dark-blue when injured. Odor and taste not registred.

Spores (4.4-) 4.9-5.5 (-6) x 4.4-4.9 x 3.3-4 µm, rhomboid in frontal view, subelliptic in lateral view, light brownish chocolate, thick walled and with a broad germ pore. Basidia 11-17 x 4.4-6 µm, two- or four-spored, hyaline, cylindrical-ventricose. Pleurocystidia none. Cheilocystidia 10-18 (-26) x 3.3-6 (-7.7) µm, abundant, forming a sterile band at the edge of the gill, polymorphous, fusoid, ventricose-rostrate, clavate, strangulate or mucronate, hyaline or some brownish. Subhymenium with parallel hyphae, strongly and irregularlly pigmented with chocolate brown pigment, 4-25 µm diam; in some parts, a lot of blue pigment can be seen diffused in the KOH between the hyphae. Trama regular, hyaline or pigmented as the subhymenium, hyphae, 5-20 µm diam, thick walled (1-3.3 µm thick), some are solid. Epicutis subgelatinized, formed by brown reddish to hyaline hyphae, parallel to the surface. Hypodermium as the subhymenium and trama hyphae.

Habitat. On rotten wood in subtropical forest at 1800 m elevation. Known only from the type locality.

Studied material. PANAMA, Prov. Chiriqui, Cerro Punta, near Nueva Suiza, July 3, 1975, Dumont PA-2074 (Holotype NY; Isotype at ENCB).

Discussion. This species is close to *P. yungensis* Sing. & Smith, but differs in the smaller and brownish cheilocystidia. The brownish cheilocystidia connects *P. dumontii* with those species described by Guzmán (1977-A) from the tropical rain forests of Mexico such as *P. singeri* Guzmán, *P. weldenii* Guzmán and others. The species is named after Dr. K. Dumont, collector of the type material, in recognition of his enthusiastic mycological work in South America.

## *Psilocybe farinacea* Rick ex Guzmán, sp. nov.

*Pileo 20-40 (-80) mm lato, convexo vel subcampanulato, spadico vel alutaceous. Lamellis adnatis, ochraceo-violaceis. Stipite 35-65 (-80) x 3-8 mm, albido, caerulescente. Velo arachnoideo albido vel violaceo. Annulo nullo. Carne caerulescente, odore et sapore farinaceis. Sporis 7.5-9 (-10.5) x 5.2-7.5 x 3-4 µm, subrhomboideis. Pleurocystidiis nullis. Cheilocystidiis 22-33 x 5-7.5 µm, hyalinis. Epicute subgelatinascente. At terram, Sao Leopoldo, Rick (Lloyd Herbarium 27598) typus*.

Pileus 20-40 (-80) mm diam., convex to subcampanulate, smooth but slightly striate at the margin, subviscid to dry, brownish to brownish reddish or straw color. Lamellae adnate or sinuate, brownish violaceous or brownish chocolate, with whitish edges or concolorous. Stipe 35-65 (-80) x 3-8 cm, cylindrical, uniform or subbulbous, hollow, whitish to brownish, smooth or with floccose fibrils at the apex, veil remnants, staining blue when injured. Veil arachnoid, white to violaceous, but not forming an annulus on the stipe. Context whitish, staining blue when cut. Odor and taste farinaceous.

Spores 7.5-9 (-10.5) x 5.2-7.5 x 3-4 µm subrhomboid in face view, elliptic in side view, thick walled brownish yellowish and with a broad basal germ pore. Basidia 10-15 x 7-8 µm, two or four-spored, vesiculose, hyaline. Pleurocystidia none. Cheilocystidia 22-33 x 5-7.5 µm, vesiculose-fusiform with more or less long necks 2-3 µm diam., hyaline, forming a sterile band along the edge of the gill. Subhymenium and trama brownish, with collapsed hyphae. Epicutis subgelatinized formed by parallel hyaline hyphae. Hypodermium brownish with elongated hyphae, 8-10 um diam. Clamp connections scarce.

Habitat. Gregarious on soil. Known only from the type locality.

Studied material. BRAZIL, Sao Leopoldo, May 1908, Rick (Holotype, Lloyd Herb. 27598; BPI).

Discussion. *P. farinacea* is very close to *P. caerulescens* Murr., but differs in the size of the spores and cheilocystidia. This species was named by Rick and sent to Lloyd but, apparently, was never described. Its bluing indicates that this species probably is hallucinogenic.

## *Psilocybe fimicola* Guzmán, sp. nov.

*A Psilocybe coprophila affini differt sporis (6.6-) 7.7-8.8 (-11) x 4.4-5 (-6) x 3.8-5 µm ellipticis, pleurocystidiis et cheilocystidiis hyalinis vel lutescentibus, 33-60 x 11-15.4 µm, mucronatis. Ad fimum, Cundinamarca, Pá-*

ramo de Palacio, Colombia, Guzmán 9096 (COL), typus.

Pileus about 10 mm diam., convex, smooth, with some white floccose traces of the silky evanescent veil, slightly striate by transparency when moist, lubricous, hygrophanous, brown to reddish yellow, fading to ochraceous or straw color. Lamellae broad adnate, brownish to brownish violaceous. Stipe sbout 25 x 1 mm, cylindrical, hollow, whitish to reddish brownish, covered with floccose, more or less white evanescent fibrils. Context whitish in the pileus, brownish in stipe, not staining blue; taste and odor none.

Spores (6.6-) 7.7-8.8 (-11) x 4.4-5 (-6) x 3.8-5 µm, elliptic both frontally and laterally, but sometimes slightly subrhomboid in face view, thin walled, with a broad germ pore. Basidia 25-30 x 6-7 µm, two of four spored , hyaline, vesiculose-pyriform. Pleurocystidia abundant, in size, shape and structure like the cheilocystidia, but many yellowish or brownish towards the base. Cheilocystidia 33-60 x 11-15.4 µm, abundant, hyaline, few are yellowish or brownish toward the base, fusiform or vesiculose, but mucronate; the mucro 4.4-5.5 µm long. Subhymenium with globose brownish yellowish elements. Trama regular, with brownish orange diffused pigment or hyaline. Epicutis subgelatinized, with hyaline thin hyphae. Clamp connections present.

Habitat. Gregarious on horse dung, in páramos at 3400 m elevation. Known only from the type locality.

Studied material. COLOMBIA, Department of Cundinamarca, Páramo de Palacio. Hacienda La Siberia, road La Calera to La Mina, July 23, 1971, Guzmán 9096 (Holotype COL; Isotype ENCB).

Discussion. P. fimicola has the fruit body and the habitat of P. coprophila but differs in the microscopic features. It is close to P. horakii Guzmán, but differs in the size of the cheilocystidia and spores. Since these species do not stain blue, probably they are not hallucinogenic. P. fimicola and P. horakii are close to P. crobula (Fr.) Lange ex Sing. for the structure of the spores.

## Psilocybe furtadoana Guzmán, sp. nov.

A Psilocybi brasiliensi affini differt pleurocystidiis nullis, sporis (4.5-) 5.5-6.6 (-7) x (3.8-) 4.4-4.9 (-5.5) x 3.8-4.2 µm. Ad terram in silvis Araucariae et Podocarpi, prope Campos de Jardao, Estado de Sao Paulo Brasiliae, Guzmán 8918 (SP) typus.

Pileus about 15 mm diam., subcampanulate to papillate, smooth, transparent-striate when moist, lubricous, hygrophanous, dark reddish brown to ochraceous or stramineo. Lamellae subadnate, dark violet brown with whitish edges. Stipe about 35 x 1 mm, cylindrical, uniform, hollow, reddish brown towards the base, covered with whitish floccose fibrils of the veil. Veil white and fugacious. Context whitish, fleshy in the pileus, brownish and fibrillose in the stipe; taste and odor farinaceous, slightly blue-staining when cut.

Spores (4.5-) 5.5-6.6 (-7) x (3.8-) 4.4-4.9 (-5.5) x 3.8-4.2 µm, subrhomboid frontally, subelliptic laterally, yellowish brown, smooth, thick walled, with a broad germ pore. Basidia 10-13.2 x 4.4-5.5 µm, four-spored, hyaline, subvesiculose. Pleurocystidia none. Cheilocystidia 11-18 x 4.4-6.6 µm, abundant, hyaline or chocolate brown toward the base, bottle shaped or sublageniform, some fusoid-ventricose. Subhymenium with elongate parallel hyphae, with reddish brown irregularly distributed pigment. Trama regular, colored like the subhymenium or hyaline, with hyphae up to 6 µm diam. Epicutis with subgelatinous reddish brown to hyaline hyphae, around 4 um diam. Hypodermium gradually hyaline, with hyphae thin walled, 5-12 µm diam. Clamp connections present.

Habitat. Solitary on soil in open forest of Araucaria brasiliana with Podocarpus. Known only from the type locality.

Studied material. BRAZIL , 5 km West of Campos de Jardao, State of Sao Paulo, March 8, 1971, Guzmán 8918 (Holotipe SP; Isotype ENCB).

Discussion. This species is close to P. brasiliensis but the absence of pleurocystidia, the structures of the subhymenium, as well as the size of the spores and cheilocystidia separate it clearly from the latter. This species is named in honor of Dr. J.S. Furtado who helped the author collected this and other fungi in Brazil.

## Psilocybe hoogshageni Heim

After studying a collection made by L. Berttucci on April 28, 1962 (BAFC) and identified by Singer as P. zapotecorum, the author of the present paper found it to represent P. hoogshageni. The material was collected in the Delta of the Rio Paraná, near Buenos Aires, in a subtropical forest on swampy soil. The author knew this locality from collecting fungi with Dr. J. Wright in Febrary of 1971, but unfortunately was unable to find this species again. It must be a very rare species there. He found only Oudemansiella canarii (Jungh.) Höhnel (topotype of O. platensis (Speg.) Speg.) a fungus of the deciduous or subtropical forests of Mexico, where P. hoogshageni grows. Berttucci's collection agrees well with the type of P. hoogshageni (in PC) in all the macroscopic and microscopic features (See Guzmán 1977-B).

## *Psilocybe horakii* Guzmán, sp. nov.

*Pileo 8-21 mm lato, convexo vel conico campanulato dein subumbonato, hygrophano, brunneo vel alutaceo, sicco. Lamellis ampli adnatis vel subdecurrentibus, spadiciis subaurantiaeis. Stipite 30-35 x 1-2 mm dilute brunneo vel rufobrunneo, fibriloso vel subfloccoso. Odore grato. Sporis (5.5-) 6-7.1 (-7.7) x 3.8-4.4 x 3.3-3.8 µm, subellipsoideis. Pleurocistidiis 19.5-30 (-46) x 7.7-9.9 (-12) µm, hyalinae mucronatus. Cheilocystidiis aequalibus pleurocystidiis, abundantibus. Ad fimum; Lagunas de Yala, prope Jujuy, Argentina, Horak 66/454 (ZT), typus.*

Pileus 8-21 mm diam., convex to conic-campanulate or subumbonate, smooth, hygrophanous, dark brown when moist, drying paler, not viscid. Lamellae broadly adnate to subdecurrent, argillaceous or orange brownish, edge concolorous. Stipe 30-35 x 1-2 mm, cylindrical or attenuated towards apex, hollow, pale brown to reddish brown, some fibrillose or floccose with fibrils, base with white tomentum. Context whitish or brownish, not blue-staining; odor pleasant (sweetish), taste not checked; spore print dark brown.

Spores (5.5-) 6-7.1 (-7.7)x3.8-4.4 x 3.3-3.8 µm, yellowish brown, subelliptic in lateral, somewhat subrhomboid in face view, thin walled, with a narrow germ pore. Basidia 16-22 x 4.4-5.5 µm, four-spored, hyaline, vesiculose. Pleurocystidia 19.5-30 (-46) x 7.7-9.9 (-12) µm, hyaline, very numerous toward the edge of the gill, vesiculose and mucronate or fusoid-cylindric and mucronate, apical mucro 1.6-5.5 x 1.4-3 µm. Cheilocystidia like the pleurocystidia, abundant, easily visible under the microscope. Subhymenium formed by globose hyaline elements, irregularly pigmented with brownish orange incrusting pigment. Trama regular, brownish with parallel hyphae, less incrusted by pigment. Epicutis subgelatinized, formed by parallel, hyaline to brownish hyphae. Hypodermium hyaline formed by elongated hyphae. Clamp connections present.

Habitat. Subgregarious on dung. Known only from the type locality.

Material Studied. ARGENTINA, near Jujuy, Lagunas de Yala, March 1, 1962, Horak 66-454 (Holotype ZT; Isotype BAFC).

Discussion. *P. horakii* is close to *P. fimicola* Guzmán (see discussion of this). The species is named after Dr. E. Horak who collected the type and kindly sent it to the author.

## *Psilocybe merdaria* (Fr.) Ricken

This fungus had been reported from Argentina by Spegassini, 1899 and Horak, 1967; from Brazil by Spegazzini, 1919; Rick, 1961 and from Uruguay by Herter, 1933 in doubtful reports, because of the various taxonomic interpretations of *P. merdaria* according to different authors. *P. merdaria* as it is understood by this writer, has spores (9.3-) 9.9-11 (-12.6) µm long., grows or dung or on rich soil and has an annulus. Those specimens with large spores (11-) 12-14 (-16.5) µm long) following Møller (1945) and Singer (1969) belong to another variety that is here described as an independent species (see below).

The fungus reported from Argentina by Spegazzini (1899) as *Stropharia merdaria* (LPS 16833) really is *P. merdaria* because of its smaller spores, but the fungus reported by Horak (1967) as *P. merdaria* belongs to the new species with bigger spores, *P. moelleri* (see below).

The studied material by the author from Venezuela (Guzmán 9171, N. of Merida, San Javier, July 27, 1971, on cow dung, ENCB) agrees well with *P. merdaria*. Its spores are subrhomboid or subhexagonal in face view, thick walled, (9.3-) 9.9-11 (-12.6) x 6.6-7.7 (-8.8) x 6-7.1 µm. Pleurocystidia are absent. Cheilocystidia are 22-27 x 6.6-7.7 µm, fusoid-ventricose with narrow neck and obtuse to capitate tips. The pileus is about 9 mm broad, convex, smooth, dry, brownish to straw-colored. Lamellae broad adnate, grayish violet. Stipe whitish to yellowish, with a membranous white annulus. This seems to be the first report of *P. merdaria* from Venezuela.

## *Psilocybe moelleri* Guzmán, sp. nov.

= *Stropharia merdaria* f. *macrospora* Möller,
Fungi Faeröes 1: 195, 1945.
= *Psilocybe merdaria* var. *macrospora* (Möller)
Sing., Nova Hedw. 29: 243, 1969

*A Psilocybe merdaria affini differt sporiis (11-) 12-14.3 (-16.5) x 7.7-8.8 x 6.6-7.7 µm. Ad fimun vel prope fimum. Dune city, Lane Oregon, U.S.A. Guzmán 16664 (ENCB), Typus*.

A complete description of this species is in Singer (*op. cit.*). *P. moelleri* differs from *P. merdaria* only in the size of the spores, as *P. coprophila* and *P. argentina*.

*P. moelleri* is a very common fungus in North America, South America and Europe, as Singer (1969) has pointed out. He reported as *P. merdaria* var. *macrospora* Sing. from Argentina and Chile. The author studied material from PERU: Dumont PE-1354, Dept. Junín, road Huancayo to Satipo, July 9, 1976 (NY) and it seems to be the first record of the species from that country.

### *Psilocybe montana* (Pers. ex Fr.) Kumm.

A very common species growing on mosses (principally *Polytrichum*) in temperate regions. Singer (1969) reported it from Chile, and in the present paper it is reported from Colombia and Venezuela.

Material studied: COLOMBIA, Cundinamarca Dept., Páramo de Palacio, Hacienda La Siberia, July 23, 1971, Guzmán 9128 (COL; ENCB); Aug. 26, 1964. Betancourt 165-A (COL; ENCB). Road to Pacho, near Upapira, Aug. 19, 1964, Guzmán 4550 (COL, ENCB). VENEZUELA, Parque Nacional Sierra Nevada, Teleférico de Mérida, La Aguada Station, July 20, 1971, Guzmán 9240; 9286 (ENCB). Sierra Nevada de Santo Domingo, Laguna de Mucubaji, July 28, 1971, Guzmán 9235; 9238 (ENCB, MER).

The description from Chile of this species given by Singer (1969) agrees well with the concept of the author of the present paper and with those materials from Mexico (Guzmán *et al*. 1977) and from Europe studied by him. An important feature not mentioned by Singer (1969) is the conspicuous yellow brown pigment incrusted on the walls of the hyphae of the subhymenium, which can be mistaken for irregular or collapsed chrysocystidia. The Colombian and Venezuelan material was collected in the páramos with *Espeletia*, at 3000-3600 m elevation.

### *Psilocybe panaeoliformis* Murr.

This species was know only from Mississippi and Alabama, U.S.A. (Murrill, 1923; Smith, 1948). It is closely related to *P. coprophila* (Bull. ex Fr.) Kumm. but differs in the small spores ((8.5-) 9.9-11 (-11.5) x 6-7.1 x 5.5-6 µm in *P. panaeoliformis*, against (9-) 10-12 (-14) x (6-) 7-9 x 6-7.1 µm in *P. coprophila*). Both are fimicolous (cow or horse dung) species. *P. panaeoliformis* reported by Kitamoto *et al*. (1975) from Japan really is *P. coprophila*. This observation is based on study by the author of the collections considered by Kitamoto *et al*. and deposited in MICH.

*P. panaeoliformis* is reported for first time from Ecuador, based on two collections made by Dumont and deposited in NY: Dumont EC-1920, and EC-1921, 22 km from Zamora, road to Loja, Aug. 1, 1975, at 1700 m elevation, gregarious on horse dung.

Dumont's collections were compared with the type (NY) and agree well, except for the presence of a more or less developed annulus. They may therefore belong to a new variety, but for the moment it appears preferable to refrain from describing a variety because of the lack of sufficient information on the fresh condition. It is possible that we have a case here similar to the one discussed under *P. andina* Guzmán

## *Psilocybe pintonii* Guzmán, sp. nov.

*Pileo 15-40 mm lato, subconvexo vel subumbonato vel subpapillato, demum frequenter applanato glabro, hygrophano, brunneolo. Lamellis sinuatis vel adnatis, brunneolis. Stipite 25-60 x 3-5 mm. Subalbo deim pileo subconcolori, floccoso versus basim. Carne caerulescente, odore farinaceo. Sporis (6-) 6.6-7.7 (-8.8) x (3.3-) 4-4.5 µm, ellipsoideis. Pleurocystidiis nullis. Cheilocystidiis 17-20 x 4-7 µm, hyalinis. Epicute subgelatinascente, hyalinae. Ad terram vegetatione herbaceae distitutam, in paramo Espeletiae. Páramo de Palacio, Hacienda La Siberia, Cundinamarca Dept., Colombia, Guzmán 9762 (COL) typus.*

Pileus 15-40 mm diam., subconvex to subumbonate or subpapillate, sometimes irregularly lobulate, eventually applanate or subconcave, smooth, but when young covered by white fibrils from the veil; sometimes slightly rimose, lubricous to dry, slightly transparently striate when moist, hygrophanous, brownish to orange brown or chocolate brown, fading to a dirty yellow. Lamellae sinuate or adnate, brownish to gray violet, thick with whitish to concolorous edges. Stipe 25-60 x 3-5 mm, cylindrical, hollow, whitish to subconcolorous with the pileus, covered toward the base by floccose white veil fibrils; base remaining somewhat blackish in dried specimens. Both pileus and stipe stain green-blue when injured. Veil well developmed when young but absent in the adult stage. Context whitish to brownish, fleshy in the pileus, fibrous-hard in stipe; staining blue when cut, with farinaceous odor and taste.

Spores (6-) 6.6-7.7 (-8.8) x (3.3-) 4-4.5 µm, ellipsoid or subelliptic, somewhat subrhomboid in face view, thin walled, smooth, brownish yellow. Basidia 16-22 x 4.4-8 µm, four-spored, cylindric-pyriform, sometimes sinuos-pyriform. Pleurocystidia none. Cheilocystidia 17-20 x 4-7 µm, hyaline, ventricose-fusoid, lageniform, irregularly ventricose with constrictions or branched or with capitate to subcapitate apex, mixed with basidia in different stages of deformation. Subhymenium brownish without incrusting pigment, but with thick irregular walls in the hyphae; these 6-25 µm broad. Epicutis subgelatinized, formed by hyaline elongated and parallel hyphae 3-5 µm broad. Hypodermium with hyphae with reddish brownish 4-8 µm broad.

Habitat. Solitary or gregarious on soil without herbaceous vegetation, in páramos with *Espeletia*, at 3450-3600 m elevation.

Studied material. COLOMBIA, Cundinamarca Dept., Páramo de Palacio, Hacienda La Siberia, road La Calera to La Mina, near the branch to Rincón del Oso, Aug. 20, 1964, Guzmán

9160 (ENCB); July 23, 1971, Guzmán 9762 (Holotype COL; Isotype ENCB).

Discussion. This species is close to P. zapotecorum Heim and P. muliercula Sing. & Smith, and certainly belongs to the same group, but the special cheilocystidia separate it well from the other species. Because of the bluing reaction and the farinaceous odor and taste, this is probably a hallucinogenic species, but there is no information about its use. The same situation holds true for P. columbiana.

Psilocybe subcubensis Guzmán, sp. nov.

A Psilocybe cubensis affini differt sporis, (9.9-) 11-13 (-14) x 7.7-8.8 x 6.6-7.1 µm. Ad fimum in regionibus tropicis vel subtropicis. Contla, NE de Tamazula, Jalisco, Mexico, Galindo (ENCB), typus.

All macroscopic and microscopic characters of this species seem to agree well with those of P. cubensis, except for size of the spores. These are (9.9-) 11-13 (-14) x 7.7-8.8 x 6.6-7.1 µm (see discussion under P. cubensis). The pileus is yellow on the margin to brownish-reddish near the umbo, fading all over to whitish. The lamellae are adnate or adnexed, grayish violet to dark violaceous. Stipe whitish, with a well developed white annulus, which becomes stained by spore deposits. Spore print dark brownish violet. Pleurocystidia 16-22 x 10-12 µm, hyaline, not numerous. Cheilocystidia 17-33 x 6.6-9 µm, with necks 2.2-5.5 µm diam., hyaline forming a sterile band at the edge of the gill.

Habitat. Gregarious on cow dung, in tropical regions, rared in subtropical regions. A pantropical and subtropical species.

Material studied. MEXICO, Jalisco, NE of Tamazula, Contla, Aug. 11, 1974, Galindo (Holotipe ENCB), and several collections from other States of Mexico, e.g. Huautla de Jiménez. HONDURAS, La Mosquitia region, Ahuas, Febr. 10, 1956, Guzmán 328-A (ENCB); Guampusirpe, March 1, 1956, Guzmás 374 (ENCB). COLOMBIA, Santander Dept., Puerto Wilches, between Gómez and km 80 of the railroad to the Atlantic, April 20, 1960, Romero 8361 (COL). Boyacá Dept., Choconta to Aguaclara, June 11, 1976, Dumont CO-4775 (NY), Dumont CO-4855-A. ECUADOR, road to Mendez, near Limón, Aug. 3, 1975, Dumont, EC-2060 (NY). BOLIVIA, Beni Dept., Prov. Vaca Diez, Guayaramerín, March 16, 1959, Singer B-2036 (BAFC; MICH). VENEZUELA, N of Mérida, San Javier del Valle, July 27, 1971, Guzmán 9165; 9182; 9183 (ENCB). AUSTRALIA, Queensland, Breban, March 25, 1974, Watling 10316 (E); near Laboutluse, April 1974, Watling 10778 (E).

Discussion. This is a hallucinogenic fungus often mistaken for P. cubensis. The smaller spores are the only characteristic feature separating this species from *P. cubensis*.

## *Psilocybe subyungensis* Guzmán, sp. nov.

*Pileo ad 10 mm lato, conico vel subpapillato, rufobrunneo vel alutaceo, hygrophano. Lamellis adnatis, violaceo-brunnis. Stipite usque ad 35 x 1 mm, concolori pileo, floccoso versus basis. Carne caerulescente. Sporis (4.4-) 5-6 (-7) x (4-) 4.4-5.5 (-6) x 3.3-4 µm, rhomboideis vel ellipsoideis. Pleurocystididiis 8.8-11 x 3.8-5.5 µm, hyalinis, sublageniniformibus. Cheilocystidiis 16.5-25 x (5.5-) 7.7-12 µm, hyalinis partim ramosis. Epicute subgelatinescente. Lignicola in sylvis, prope El Arco, Macaro, Miranda, Venezuela, Dumont VE-6363 (MER), Typus.*

Pileus about 10 mm diam., conic to subpapillate, smooth but somewhat striate at the margin, subviscid to dry, hygrophanous, reddish brown or brown, fading to yellowish, but staining blue to blakish when injured. Lamellae adnate, violaceous brown, edges concolorous or some whitish and floccose. Stipe about 35 x 1 mm, cylindrical, hollow, reddish brown to darker toward the base, appressed silky floccose from white fibrils, principally at the base. Veil ruddimentary and fugacious in the adult stage. Context brownish, bluing. Odor and taste unknown.

Spores (4.4-) 5-6 (-7) x (4-) 4.4-5.5 (-6) x 3.3-4 µm, rhomboid in face view, subelliptic in side view, brownish yellow, with thick wall and distinct broad germ pore, with a short basal appendage. Basidia 10-20 x 4.4-6 µm, four-spored, hyaline, vesiculose-cylindric, with a slight constriction in the middle. Pleutocystidia 8.8-11 x 3.8-5.5 µm, hyaline, scanty, sublageniform or fusoid-ventricose with short neck, 1-2 µm diam. Cheilocystidia 16.5-25 x (5.5-) 7.7-12 µm, hyaline, lageniform, fusoid-ventricose, subpyriform, clavate, ventricose with constrictions in the middle, ampullaceous to somewhat irregularly branched, often reminding one of basidia. Subhymenium brownish yellow with more or less parallel hyphae, strongly irregularly pigmented on the walls. Trama regular, subhyaline or yellowish, with parallel hyphae 7-12 µm broad, with pigment incrusted on the thick walls, with appear perforated. Epicutis subgelatinized, hyaline with elongated hyphae 3-5 µm broad. Hypodermium like the subhymenium and trama. Some parts of the epicutis and subhymenium with blue green diffused pigment in KOH. Clamp connections present.

Habitat. Gregarious on very rotten wood inside the forest. Known only from the type locality.

Studied material. VENEZUELA, State of Miranda, SW of Macaro, near El Arado, July 28, 1972. Dumont VE-6363 (Holotipe MER, Isotype, NY).

Discussion. P. subyungensis is close to P. yungensis, but the pleurocystidia and cheilocystidia separate the former from the latter. It is also close to P. fuliginosa (Murr.) Smith but according to a study of the type (NY) and Smith's paper (1948), has larger spores, (5.5-) 6-7 (-8) µm long., the cheilocystidia are more uniformly lageniform 16-28 (-33) x 4.4-6.6 µm.

Psilocybe tortipes Speg., Ann. Mus. Nac.Buenos Aires 6:151, 1898. Synonymy of Naematoloma tortipes (Speg.) Guzmán, Mycotaxon 6: 476, 1978.

The author recently transfered this taxon to Naematoloma (Guzmán & Vergeer, 1978) after study of the type (LPS 16820), which has spores 12-18 (-19) x (6-) 9.7-15 µm and chrysocystidia 20-45 x 5-15 µm. Psilocybe tortipes sensu Rick after study the material: Rick 179 (PACA 14560) (and in FH, PC, BPI and NY) is another species of Naematoloma, because has spores 10.5-13 (-15) x 6-7.5 µm (Rick, 1961, reported spore size 12-14 x 9-10 µm, as did Spegazzini in the original description) (!). Singer (1951) considered P. tortipes sensu Rick as Naematoloma subumbonatescens (Murr.) Sing. (a synonym of N. ericaceus Pers. ex Fr.) Smith). Spegazzini himself was apparently not too familiar with P. tortipes, since another collection (LPS 16821) of P. tortipes is a Panaeolus sp.

Psilocybe uruguayensis Singer ex Guzmán, sp. nov.

Pileo 10-30 mm lato, convexo, laevi, rubro-brunneo vel alutaceo, non caerulescente. Lamellis adnatis, brunneo-violaceis. Stipite 40-55 x 2-3 mm albido vel concolori pileo, haud caerulescente, annulatus. Sporis (7.5-) 8.8-11.3 (-12.7) x 7-8 (-9) x 6-7 µm, ovoideis vel subrhomboideis vel inaequilateralibus. Pleurocystidiis nullis. Cheilocystidiis 24.5-32 x 4.5-9 µm, hyalinis,longicollis, collo 1.5-2 µm lato, interdum ramoso. Subhymenio et tramate subbrunneis vel hyalinis. Hyphis fibulatis. Ad fimum, Uruguay, García Zorrón 2439 (BAFC) typus.

Pileus 10-30 mm diam., convex, smooth subviscid, brownish to brownish yellow, not staining green or blue in any part. Lamellae adnate to somewhat sinuate, brownish to violaceous-brown, unicolorous. Stipe 40-55 x 2-3 mm, cylindric, not bulbous, smooth, whitish above to brownish or concolorous with pileus below. Annulus membranous, whitish, not staining blue. Context whitish, not bluing. Odor and taste unknown.

Spores (7.5-) 8.8-11.3 (-12.7) x 7-8 (-9) x 6-7 µm, ovoid or subrhomboid in face view, inequilateral, smooth, with thick yellowish brown wall, with truncated apex because of a flattened germ pore. Basidia 25-30 x 7.5-9.5 µm, including sterigmata which are 4-6 µm long, four-spored, hyaline, subcylindric or vesiculose. Pleurocystidia none. Cheilocystidia 24.5-32 x 4.5-9 µm, hyaline, abundant, forming a sterile band at the edge of the gills, ventricose-elongated, somewhat pedicellate, but with a narrow and long neck which is 1.5-2 µm broad, sometimes branched in old specimens. Subhymenium pale yellowish brown, without incrusted pigment. Trama regular, same color as the subhymenium or hyaline, with inflated hyphae up to 35 µm broad. Epicutis with a thick layer of gelatinous hyphae, parallel to the surface. Clamp connections present.

Habitat and distribution. Gregarious on horse dung, only known from the type locality.

Studied material. URUGUAY, Montevideo, Parque Nacional Carrasco, April 3, 1960, García Zorrón 2439 (Holotype BAFC: Isotypes in MICH and ENCB).

Discussion. The name *P. uruguayensis* was given to a collection in BAFC by Singer but remained unpublished. Singer thinks that this species stains blue when fresh. It is close to *P. blattariopsis* (Speg.) Sing. but this species has brown pleurocystidia according to a study of the type (Spegazzini 1535, LPS). It is also close to *P. subaeruginascens* Höhnel, *P. stuntzii* Guzmán & Ott and *P. venenata* (Imai) Imaz. & Hongo, but differs in the size of the cheilocystidia and spores; it is interesting to see the geographical distribution of these species; *P. subaeruginascens* in only known from Java, *P. venenata* from Japan and *P. stuntzii* from the NW of North America. (See discussion of *P. blattariopsis*).

## *Psilocybe wrightii* Guzmán

*Pileo 25-65 mm lato, subconvexo vel subumbonato, margine substriato, levi, viscido, hygrophano, brunneo vel rufobrunneo vel alutaceo. Lamellis subadnatis vel sinnuatis, alutaceo violaceois vel brunneo-violaceis. Stipite 80-95 x 5-9 mm, carneo albido deim brunneolo, ad basim floccoso, caerulescente. Carne caerulescente, odore et sapore farinacis. Sporis (6-) 6.6-7.7 (-8.5) x 5.5-6.6 (-7.1) x 3.5-5.5 µm, subrhomboideis vel subellipsoideis. Pleurocystidiis 15-22 x 5.5-6.6 µm, hyalinis, sursum 3.3-4 um latis. Cheilocystidiis 13-22 x 4.5-6 µm, hyalinis, brevibus collo 2-2.5 um diam. Epicute gelatinascente. Ad terram, gramminicola, prope Estación de Aforos, road Tucumán to Tafí del Valle, Argentina, Guzmán 8683 (BAFC) typus.*

Pileus 25-65 mm diam., subconvex to subumbonate, smooth to substriate at the margin, some rimose in old specimens, viscid to subviscid, hygrophanous, brown or reddish brown to brownish yellow, some straw-colored. Lamellae subadnate or sinuate, yellowish violaceous to brownish violaceous or chocolate brown, somewhat mottled; edges whitish to concolorous. Stipe 80-95 x 5-9 mm, cylindrical, equal or slightly subbulbous, hollow, whitish to yellowish, finally brown reddish to blackish; staining blue when touched or injured; covered by floccose white fibrils toward the base. Context white and fleshy in the pileus, yellowish and subgelatinous to subcartilaginous in the stipe; staining blue when cut. Odor and taste farinaceous. Spore print dark violaceous-brown.

Spores (6-) 6.6-7.7 (-8.5) x 5.5-6.6 (-7.1) x 3.5-5.5 µm, subrhomboid, some obscurely angular in face view, but broadly elliptic or subelliptic in side view, smooth, yellowish brown thick walled, with broad flattened germ pore. Basidia 20-30 x 6-8 µm, four spored, vesiculose-pyriform, with a slight constriction in the middle. Pleurocystidia 15-22 x 5.5-6.6 µm, hyaline, not abundant, vesiculose-fusoid, attenuate above and with a rounded nucro or sublageniform, neck 3.3-4 um across. Cheilocystidia 13-22 x 4.5-6 µm hyaline, ventricose-rostrate, with necks 2-2.5 µm, forming a sterile band along the gill edge. Subhymenium yellowish with irregular brownish yellow pigment incrustations. Trama hyaline to yellowish, parallel, colored by brownish yellow pigmented irregularly incrusted hyphae which often resemble collapsed chrysocystidia. Epicutis formed by subgelatinized parallel hyphae, which are elongated to subglobose, hyaline to brownish. Hypodermium yellowish or hyalie, with some latiferous hyphae, hyaline or brownish, 5-7 µm broad. Clamp connections present.

Habitat. Gregarious on grassy soil outside of the subtropical forest at 900 m elevation.

Studied material. ARGENTINA, road Tucumán to Tafí del Valle, 3 km W of Station Aforos, Febr. 18, 1971, Guzmán 8683 (Holotype BAFC; Isotype ENCB).

Discussion. P. wrightii is close to P. caerulescens Murr. but the pleurocystidia and the pigmented trama separate it from the latter as well as the thin floccose stipe. The report of P. caerulescens by Singer and Digilio (1951) from the Rio de los Sosas, which is close to Aforo Station, it is possible a record of P. wrightii (no material of that species was available to the author in LIL and in BAFC). The species here described, is certainly hallucinogenic because of its bluing, and its taste and flavor. It is named after Dr. J.E. Wright, who helped the author during his collecting trip to Argentina in 1971.

## Psilocybe yungensis Singer & Smith

This species was described (Singer & Smith, 1958) from Bolivia and more late (Heim & Wasson, 1958) reported from Mexico; both localities in deciduous forests at 1500-2000 m alt. The study of the type (Singer B-648, MICH) as well as many collections from Mexico (in ENCB) let to the author to know the variation on the form of the pileus and to establish that *P. yungensis* var. *diconica* Sing. & Smith described from the same locality of the type variety (Singer & Smith, 1958) is a synonym of that. The obconic or conic papilla on the pileus is the only feature used by Singer and Smith to separate both taxa, but as it is possible to find intermediate specimens in the same population, the author did not think sufficiently distinct to separate both forms. Even, studying the plates of *P. yungensis* in Heim & Wasson (1958) and in Heim *et al*. (1967) it is possible to see the variation of the pileus, from conic to papillate in different forms, both in wild or culture specimens. This variation of the pileus is also possible to observe in *P. hoogshageni* Heim, *P. zapotecorum* Heim emend. Guzmán and in *P. fagicola* Heim (this latter only known from Mexico). The spores of *P. yungensis* are (4.4-) 5-6 (-7) x (3.8-) 4.4-5 (-6.2) x 3.3-4 μm.

## *Psilocybe zapotecorum* Heim
emend. Guzmán, Nova Hedwigia, 1977

Until now this species was known only from Mexico (Heim and Wasson, 1958) growing on muddy soil in the subtropical forest. Recently (Guzmán, 1977-B) made an emendation and included *P. candidipes* Sing. & Smith and *P. bolivarii* Guzmán as synonyms. *P. zapotecorum* is indeed very variable in the form and the colors of the fruiting body, but the microscopic characteristics are constant. The South American material here studied agrees well with the type and with other Mexican specimens. They have spores (5-) 6-7 (-7.5) x (3.3-) 3.5-3.8 (-4.2) um, elliptic, brownish pallid thin walled. Pleurocystidia 21-30 x 9.9-14 um, hyaline or occasionally brownish, globose-piriform. Cheilocystidia 13-25 x 3.5-6 um, hyaline, fusoid-ventricose or lanceolate pyriform, some with long necks, singly or rarely branched. All carphores are strongly bluing, even in the hymenium and subhymenium (in KOH). *P. zapotecorum* is close to *P. aggericola* Sing. & Smith as was discussed in this paper. The material studied so far represents new records of this species.

Studied material. PERU, Dept. of Huanuco, road to Pucalpa, 38 km from Tingo Maria, July 4, 1976, 1600 m elevation, Dumont PE-756 (NY); PE-809 (NY). BRAZIL, Parque do Estado Sao Paulo, June 13, 1961, Furtado (SP, 62044; ENCB).

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# STUDIES IN THE GENUS CORTINARIUS, IV: SECTION DERMOCYBE, NEW NORTH AMERICAN SPECIES[1]

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## SUMMARY

Two new species of *Cortinarius*, *C. cascadensis* and *C. idahoensis*, are described from western North America. Both are in the section *Dermocybe*.

## INTRODUCTION

In our investigations of *Dermocybe* in North America we have designated several new taxa (1-4). Certain species, such as *C. incognitus* Ammirati and Smith, seem to be widespread and fairly common, while others, for example *C. humboldtensis* Ammirati and Smith, appear to be relatively rare. Based on collecting done by the authors in the western mountains and coastal regions of North America it appears that both *C. cascadensis* and *C. idahoensis* are rare. These taxa were first recognized as distinct in the early 1970's and since then we have gathered no further

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[1] Portion of a dissertation submitted by the senior author to the Graduate School of The University of Michigan in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

information on them. With the publication of their descriptions here it is hoped that workers in western North America will search for these species in their mushroom flora.

Microscopic studies were made from freehand sections mounted in KOH (2.5% aqueous solution) and Melzer's reagent. Macroscopic color reactions were made with 2.5% KOH. Specific color designations capitalized and enclosed in parentheses are from R. Ridgway, *Color Standards and Color Nomenclature (5)*. Uncapitalized color terms are regarded as useful approximations. Collections cited in 'Collections examined' are deposited in The University of Michigan Herbarium (MICH).

## CORTINARIUS CASCADENSIS Ammirati and Smith, Sp. Nov.

Fig. 1

*Pileus 10-35 mm latus, convexus demum plano-convexus vel planus vel umbonatus, siccus, appresso-fibrillosus, margine olivaceo-fulvus, disco rufo-brunneus; contextus subolivaceo-flavus; odor et sapor nulli; superficies pilei et lamellae rufescentes in solutione kalii hydroxidi. Lamellae confertae demum subdissitae, initio sordide olivaceo-flavae deinde ferrugineo-brunneae, numquam aurantiacae. Stipes 20-55 mm longus, 2-8 mm crassus, aequalis vel subclavatus, bubalino-flavus, fibrillis bubalino-flavis vel subochraceis obtectus. Sporae 6-7.5 (-8) x (3.5) 4-4.5 µm, ellipticae, verruculosae. Holotypus: J.F. Ammirati 6156 (MICH), prope Lincoln Co., Oregon, November 11, 1971.*

PILEUS 10-35 mm broad, at first obtusely convex, expanding to plano-convex or plane, umbonate to subumbonate, with the margin incurved to decurved, opaque, moist to dry, appressed fibrillose, margin at first olivaceous (Old Gold) with faint olive-yellow (Aniline Yellow) tones along the edge and sometimes streaked reddish brown to dull brown, becoming more ochraceous to light fulvous (Ochraceous-Tawny) or reddish brown (Tawny) and in age sometimes shaded or streaked deep reddish brown (Warm Sepia or blackish Warm Sepia), disc at first more or less reddish brown (Tawny) becoming deeper reddish brown (Warm Sepia to Seal Brown). Context in younger basidiocarps watery olive or dull light yellow faded, in age more olive or shaded with reddish brown tones; odor not distinctive, taste not distinctive or raphanoid.

LAMELLAE close becoming subdistant, adnexed to uncinate, more or less ventricose mature, edges serrate, at first dull olive-yellow (Aniline Yellow) to brownish olive-yellow with olive-yellow edges, slowly more brownish to rusty brown and when real old rusty reddish brown or deep rusty brown, never passing through a distinct orange stage.

STIPE 20-55 mm long, apex 2-8 mm thick, equal or the base slightly enlarged, terete, apex silky and at first light dull yellow (Mustard Yellow) to buffy yellow (Buff-Yellow) or more ochraceous, from near the apex to the base covered by a more or less continuous sheath of buffy yellow (Buff-Yellow) to light ochraceous appressed fibrils, overall soon becoming watery orange-ochraceous to dull orange or orange-tawny, lower portion finally watery reddish brown (± Tawny) or darker reddish brown (Russet to Chestnut), in age the color may become sordid. Context stuffed, becoming hollowed, cortex dull ochraceous-orange and darkening as the surface, pith pale ochraceous buff to pale ochraceous or slightly orange-ochraceous.

PILEUS SURFACE AND LAMELLAE of fresh basidiocarps reddish with KOH.

SPORES 6-7.5 (-8) x (3.5-) 4-4.5 μm, in profile elliptic and obscurely- to somewhat inequilateral, in face view ovate to somewhat elliptic, verruculose, in KOH pale to light brown or pale yellow-brown, in Melzer's light yellow-brown to light yellowish orange-brown. BASIDIA 4-spored, 22-31 x 5-8 (-9) μm, clavate to somewhat ventricose, thin-walled, in KOH hyaline or less commonly containing concentrated yellow pigment or some more or less filled with yellow particles, in Melzer's pale yellow or more or less filled with yellow to yellow-orange particles. PLEUROCYSTIDIA absent. CHEILOCYSTIDIA not well differentiated, 10-16 x 5-8 μm, clavate to narrowly clavate, thin-walled, in KOH and Melzer's similar to basidia. SUBHYMENIAL HYPHAE compactly interwoven, cylindrical, 3-7 μm wide, thin-walled, in KOH and Melzer's as for hyphae of the lamellar trama. TRAMAL HYPHAE OF LAMELLAE subparallel to slightly interwoven, cylindrical to more or less inflated, 8-28 μm wide, thin-walled, in KOH hyaline to pale yellow, some containing concentrated yellow pigment or yellow particles, in Melzer's pale yellow. CUTICULAR HYPHAE OF PILEUS interwoven, more or less radially arranged, cylindrical to slightly inflated, 4-15 μm wide, thin-walled (up to 1.5 μm thick), in KOH hyaline to light yellow-brown or containing more or less concentrated brownish to vinaceous brown pigment, in Melzer's hyaline to brownish or yellowish brown; pileocystidia absent. TRAMAL HYPHAE OF PILEUS interwoven, more or less radially arranged, cylindrical to inflated, 8-30 µm wide, thin-walled, in KOH hyaline, pale yellow or pale yellow-green, some containing yellow to orange particles, in Melzer's pale yellow, some containing yellowish particles. CORTICAL HYPHAE OF STIPE longitudinally arranged, subparallel to more or less interwoven, cylindrical to more or less inflated, 8-25 µm wide, thin-walled, in KOH hyaline to pale yellowish, some filled with concentrated yellow pigment or containing yellowish particles, in Melzer's pale yellow to yellowish brown; caulocystidia present near the stipe apex, 15-60 x 7-15 µm, clavate to narrowly clavate or cylindrical, sometimes with a rounded-mucronate apex, thin-walled, in KOH hyaline to pale yellow, in Melzer's pale yellowish. CORTICAL HYPHAE cylindrical, 3-7 µm wide, thin-walled, in KOH hyaline to pale yellow, some containing yellow particles, in Melzer's pale yellow. CLAMP CONNECTIONS of the normal type, present throughout the basidiocarp. OLEIFEROUS HYPHAE present, in KOH yellowish to somewhat greenish or olivaceous. INTERHYPHAL PIGMENT DEPOSITS present in the pileus and lamellar trama and in the stipe cortex, in KOH yellow, yellowish green or olive-yellow, in Melzer's yellowish.

Gregarious on humus, rotten wood and on moss-covered base of hemlock trees, mixed conifer forest (hemlock, Douglas fir and spruce), November.

*C. cascadensis* is a very striking species characterized by an olive to fulvous or more reddish brown pileus, persistently dull olive-yellow lamellae and a dull yellow or buff-yellow to ochraceous stipe which soon becomes watery orange-ochraceous to dull orange throughout.

The olive-yellow lamellae distinguish it from species with orange lamellae, such as *C. zakii* Ammirati and Smith and *C. croceofolius* Peck. *C. humboldtensis* Ammirati and Smith is distinguished from *C. cascadensis* by its larger spores, the dark inky-violet KOH reaction of fresh pilei and the lack of strong orange colors in the stipe. *C. olivaceopictus* Ammirati and Smith has in common with *C. cascadensis* small spores and yellowish olive lamellae. The former, however, has a strongly olivaceous stipe with ferruginous to orange fibrils or fibrillose zones on the surface, a strongly olive-colored context and very small interhyphal pigment deposits.

*C. cascadensis* is named after Cascade Head Experimental Forest, Lincoln Co., Oregon.

Collection examined: OREGON: Lincoln Co.: J.F. Ammirati 6156 (holotype, MICH).

## CORTINARIUS IDAHOENSIS Ammirati and Smith, Sp. Nov.

Figs. 2 and 3

*Pileus 20-40 cm latus, obtusus vel convexus, deinde late convexus vel planus, fibrillosus, subhygrophanus, fuscus demum olivaceo-brunneus; contextus olivaceus demum ochraceus; odor indistinctus, sapor plusminusve amarus; superficies pilei rufo-brunnea in solutione kalii hydroxidi. Lamellae confertae, adnexae, ferrugineo-ochraceae vel aurantio-ochraceae. Stipes 40-70 mm longus, 5-10 mm crassus, aequalis, ferrugineo-ochraceus, fibrillis ochraceis obtectus. Sporae 7-9 x 4.5-5.5 μm, ellipsoideae, verruculosae. Hyphae cuticulae intertextae, pigmentia caeruleo-purpurea in solutione kalii hydroxidi praebentes. Holotypus: A.H. Smith 71073 (MICH), prope Bonner Co., Idaho, October 5, 1964.*

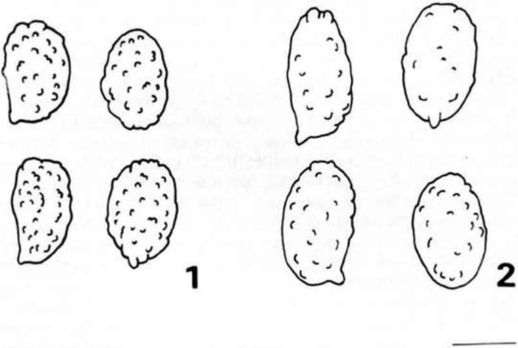
PILEUS (10-) 20-40 mm broad, obtuse to convex, becoming broadly convex to plane, with the margin incurved to decurved, fibrillose, moist and often fading (subhygrophanous), dark brown (a dark Bister) to dark cinnamon (Warm Sepia) moist, fading to olive-brown (Tawny-Olive), more or less opaque at all stages. Context olive when moist, ochraceous faded; odor indistinctive, taste more or less bitter.

LAMELLAE adnexed, close, broad, rusty ochraceous becoming ferruginous (near Sanford's Brown), then orange-ochraceous to orange-fulvous.

STIPE 40-70 mm long, 5-10 mm thick, equal or nearly so, near rusty ochraceous and darkening (more ochraceous) from the base upward, with a covering of ochraceous fibrils. Context solid becoming hollowed, rusty ochraceous within to the base, in base orange-fulvous to dark fulvous.

PILEUS SURFACE of fresh basidiocarps reddish brown with KOH.

SPORES 7-9 x 4.5 - 5.5 µm, in profile elliptic and obscurely- to somewhat inequilateral, in face view elliptic to ovate, verruculose, in KOH brownish to pale fulvous, in Melzer's light yellowish to yellowish brown. BASIDIA 4-spored, 24-35 x 5.5 - 7 µm, clavate to more or less ventricose, thin-walled, in KOH hyaline to pale vinaceous or containing particles and masses of deep red to vinaceous red pigment, in Melzer's light yellow or containing yellowish, brownish, orange, or reddish orange particles. PLEUROCYSTIDIA absent. CHEILOCYSTIDIA: 8-17 x 6-8 µm, slavate to broadly clavate, thin-walled, in KOH and Melzer's similar to basidia. SUBHYMENIAL HYPHAE compactly interwoven, cylindrical, 2-5 (-6) µm wide, thin-walled, in KOH and Melzer's as for the hyphae of the lamellar trama. TRAMAL HYPHAE OF LAMELLAE subparallel to slightly interwoven, cylindrical to more or less inflated, 5-25 µm wide, thin-walled, in KOH hyaline to pale vinaceous, in Melzer's yellowish. CUTICULAR HYPHAE OF PILEUS interwoven, more or less radially arranged, cylindrical to more or less inflated, 4.5 - 18 (-20) µm wide, thin-walled (up to 1.5 µm thick), in KOH hyaline to pale brownish or containing a more or less concentrated reddish brown, vinaceous brown, or olive-brown to olive pigment, some containing colorless droplets and granules or particles of bluish to bluish purple pigment, in Melzer's yellowish, yellow-brown, yellowish orange-brown, or yellow-orange, some containing droplets and colorless granules; pileocystidia absent. TRAMAL HYPHAE OF PILEUS interwoven, more or less radially arranged, cylindrical to inflated, 6-40 µm wide, thin-walled, in KOH hyaline to pale brownish or pale vinaceous in the lower portion, above (in the subcuticular zone) containing particles of bluish to bluish purple pigment, in Melzer's light yellowish below, above (in the subcuticular zone) as for the hyphae of the pileus cuticle. CORTICAL HYPHAE OF STIPE longitudinally arranged, subparallel to slightly interwoven, cylindrical to more or less inflated, 6-25 µm wide, thin-walled, in KOH hyaline or pale pinkish to pale vinaceous, some containing colorless droplets and granules, in Melzer's pale yellow to light yellow, often containing droplets and granules; caulocystidia present on the stipe apex, 35-88 x 8-15 µm, cylindrical to tapered, not well differentiated, thin-walled, in KOH and Melzer's as for the basidia. CORTINAL HYPHAE cylindrical, 3-10 (-12) µm wide, thin-walled, in KOH as for the hyphae of the stipe cortex or some containing a more or less concentrated reddish pigment, in Melzer's yellowish. CLAMP CONNECTIONS of the normal type, present throughout the basidiocarp.



FIGS. 1-2: Basidiospores (x 1800). 1. *Cortinarius cascadensis*. 2. *Cortinarius idahoensis*.

OLEIFEROUS HYPHAE present in the pileus trama and stipe cortex, in KOH slightly vinaceous to yellow-olive or olive, in Melzer's none observed. INTERHYPHAL PIGMENT DEPOSITS present in the pileus and lamellar trama and in the stipe cortex, in KOH red to vinaceous, sometimes fading to yellowish, in Melzer's yellow, orange, or reddish orange.

Gregarious under conifers on humus or rotted wood, September through November.

Collections examined: IDAHO: Bonner Co.: A.H. Smith 71073 (holotype, MICH). WASHINGTON: Clallam Co.: A.H. Smith 17294.

The most striking characteristic of this species is the presence of bluish to bluish purple particles of pigment in the hyphae of the cuticle and subcuticle of the pileus when mounted in KOH. This type of KOH reaction is not common in *Dermocybe* but does occur in *C. humboldtensis*, a species with olive-yellow lamellae, and *C. semisanguineus* (Fries) Gillet and its relatives, which have red lamellae.

Another interesting feature of *C. idahoensis* is the tendency of the pileus to lose moisture and fade (subhygrophanous) from reddish brown to olive-brown. This has been recorded for most of the specimens collected so far and seems to be a fairly constant characteristic. Truly hygrophanous pilei are not characteristic of *Dermocybe*.

The rusty ochraceous to orange ochraceous lamellae of *C. idahoensis* indicates some affinity with Dermocybes that have orange lamellae. At least two species with orange lamellae, *C. zakii* and *C. aurantiobasis* Ammirati and Smith, occur fairly commonly in areas of western North America where *C. idahoensis* has been found. *C. zakii* has deep orange lamellae when young, spores (6-) 6.5 - 8(-9) x 4 - 4.5 (-5) µm, and a coating of dull brown to vinaceous brown fibrils over the stipe surface. *C. aurantiobasis* is easily separated from *C. idahoensis* by its large spores (8.5 - 11(-12) x 5-6 µm).

FIG. 3: *Cortinarius idahoensis*, x 1 (A.H. Smith 17294).

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# BELIZEAN HYPHOMYCETES

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## ABSTRACT

Fourteen papers are cited as references to the distribution of fungi in Belize (formerly British Honduras). This paper lists 45 species of hyphomycetes not previously recorded.

There is very little information available concerning the fungi of Belize. This paper lists 45 species of hyphomycetes which were collected there. The only imperfect fungus reported previously was the pycnidial stage of *Hypocrella turbinata* which was studied intensively by Karling (1936). The Belizean specimens were from the Orange Walk District. The earliest references to the fungi of Belize appear to be those of Murrill (1911 a, b, c; 1912; 1913; 1918 a, b). Murrill described three new species (*Lentinus subscyphoides*, *Hydrocybe hondurensis* and *Crepidotus bicolor*) and included notes on nine other species of agarics based upon collections made by M. E. Peck. From the collections of Mains, Smith (1940) described a new species, *Mycena hondurensis*, and listed three other agarics with notes. In a momograph of the genus *Prospodium*, Cummins (1940) proposed a new combination based upon a specimen collected in the Cayo District, a new species, *P. constrictum*, collected near Jacento Creek and named *Uraecium cydistae* as a new species based upon an aecial stage from Stann Creek. In addition another

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species of *Prospodium* was collected in the Belize District Other reports are based upon collections made during the Summer of 1936 by E.B. Mains and C.L. Lundell. With few exceptions these were obtained from the Cayo District. Mains (1937, 1940a) described two new species and listed five other species of *Cordyceps*. In 1939, Mains listed 58 species in 11 genera of Uredinales as occuring in Belize. A new rust genus, *Tegillum*, was described by Mains (1940b).

Collections listed in this paper were made by W.E. Pryor in 1970, K.M. Augsburg-Luczynski in 1971 and R.A. McCord in 1973. All three were students at Western Illinois University who were participants in the Tropical Biology Program of the Associated Universities for International Education. The designations WEP, KMAL, and RAM refer to these collectors. Collections not so designated were made by the author in 1969 and 1970. The specimens are deposited in the Mycological Collection of Western Illinois University (WMI).

1. *Acrodictys erecta* (Ell. & Ev.) M.B. Ellis, Mycol. Pap., 79:12, 1961.

   On dead palm, Columbia Forest Station, Toledo District, 7/28/70, EFM No. 1320b.

2. *Acrodictys globulosa* (Toth) M.B. Ellis, Mycol. Pap., 103:34, 1965.

   On dead wood, Central Farm, Cayo District, 7/25/69, EFM No. 1211.

3. *Acrogenospora sphaerocephala* (Berk. &Br.) M.B. Ellis, Dematiaceous Hyphomycetes, p. 114, 1971.

   On decaying bark, Columbian Forest, between San Jose and San Antonio, Toledo District, 7/30/70, (WEP), EFM No. 1334.

4. *Aspergillus niger* van Tiegh., Annls. Sci. Nat. (Bot.), Ser. 5, 8:240, 1867.

   On decaying fruit, Long Cay, Glovers Reef, Belize District, 7/25/73, (RAM), EFM No. 1565.

5. *Beltrania rhombica* O. Penzig, Nuovo G. bot. ital, 14:72, 1882.

   On dead leaves, Long Cay, Glovers Reef, Belize District, 7/22/73, (RAM), EFM No. 1561.

6. *Clonostachys cylindrospora* Arnaud, Bull. Soc. Mycol. France 68:196, 1952. [nomen nudum]

   On decaying seed coat, Roaring Creek, Cayo District, 6/28/71, (KMAL), EFM No. 1414b.

7. *Codinaea assamica* (Agnihothrudu) Hughes & Kendrick, N.Z. Jl. Bot., 6:334, 1968.

   On dead wood, Columbia Forest Station, Toledo District, 7/9/71, (KMAL), EFM No. 1430; On dead leaf, Blancaneaux Lodge, Cayo District, 7/7/73, (RAM), EFM No. 1519.

8. *Corynespora leptoderridicola* Deighton & M.B. Ellis, Mycol. Pap., 65:7, 1957.

   On dead bark, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1378a.

9. *Corynespora siwalika* (Subram.) M.B. Ellis, Mycol. Pap., 82:53, 1961.

   On dead twig, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1368a.

10. *Curvularia lunata* (Wakker) Boedijn, Bull. Jard. bot. Buitenz., III, 13(1):127, 1933.

    On dead *Paspalum conjugatum*, Central Farm, Cayo District, 7/25/69, EFM No. 1208.

11. *Dendryphion nanum* (C.G. Nees ex S.F. Gray) Hughes, Can. J. Bot., 36:761, 1958.

    On dead wood and bark, Columbian Forest, between San Jose and San Antonio, Toledo District, 7/30/70, (WEP), EFM No. 1335a.

12. *Dictyoarthrinium sacchari* (Stevenson) Damon, Bull. Torrey bot. Club, 80:164, 1953.

    On dead cane stems, Columbia Forest Station, Toledo District, 7/28/70, EFM No. 1323b.

13. *Dictyosporium heptasporum* (Garov.) Damon, Lloydia 15:118, 1952.

    On dead woody branch, Columbia Forest Station, Toledo District, 7/28/70, EFM No. 1317b.

14. *Dictyosporium zeylanicum* Petch, Ann. Roy. Bot. Gard. Peradeniya 6:252, 1917.

    On dead wood, Columbian Forest, between San Jose and San Antonio, Toledo District, 7/31/70, (WEP) EFM No. 1361b.

15. *Exosporium ampullaceum* (Petch) M.B. Ellis, Mycol. Pap., 82:32, 1961

    On dead woody branch, Columbia Forest Station, Toledo District, 7/28/70, EFM No. 1317a.

16. *Exosporium phyllantheum* (Sacc.) M.B. Ellis, Mycol. Pap., 82:29, 1961

    On dead wood, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1370b.

17. *Gyrothrix circinata* (Berk. & Curt.) Hughes, Can. J. Bot., 36:771, 1958.

    On palm, Southwest Cay, Glovers Reef, Belize District, 7/27/73, (RAM), EFM No. 1567.

18. *Harpographium fasciculatum* Saccardo, Michelia, 2:33, 1880.

    On dead woody branches, Central Farm, Cayo District, 7/25/69, EFM No. 1210; On dead woody branches, Columbian Forest, Toledo District, 7/28/70, EFM No. 1326; On dead woody branches, Columbia Forest Station, Toledo District, 7/28/70, EFM No. 1329.

19. *Helicoma intermedium* (Penzig & Saccardo) Linder, Annals Mo. Bot. Gard., 16:306, 1929.

On coconut husk, Wilson's Motel grounds, Corozal, Corozal District, 7/23/69, EFM No. 1202.

20. *Helicosporium aureum* (Corda) Linder, Annals Mo. Bot. Gard. 16:279, 1929.

On dead wood, Blancaneaux Lodge, Cayo District, 7/9/73, (RAM), EFM No. 1528.

21. *Melanographium cookei* M.B. Ellis, Mycol. Pap., 93:19, 1963.

On dead wood, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1370a.

22. *Periconia cookei* Mason & M.B. Ellis, Mycol. Pap. No. 56, p. 72, 1953.

On dead herbaceous stems, Central Farm, Cayo District, 7/25/69, EFM No. 1215; On dead herbaceous stems Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1376.

23. *Periconia lateralis* Ell. & Ev., J. Mycol., 2:104, 1886.

On dead cane stems, Columbia Forest Station, Toledo District, 7/28/70, EFM No. 1323a.

24. *Periconia minutissima* Corda, Icones fugorum, 1, p. 19, 1837.

On dead woody branch, Altun Ha, Belize District, 7/23/69, EFM No. 1207.

25. *Phaeoisaria clematidis* (Fuckel) Hughes, Can. J. Bot., 36:795. 1958.

On dead wood, Columbia Forest Station, Toledo District, 7/27/70, (WEP), EFM No. 1309; On dead wood, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1381.

26. *Phragmospathula phoenicis* Subram. & Nair, Antonie Van Leeuwenhoek, 32:384, 1966.

    On palm, Southwest Cay, Glovers Reef, Belize District 7/27/73, (RAM), EFM No. 1577.

27. *Pithomyces chartarum* (Berk. & Curt.) M.B. Ellis, Mycol. Pap., 76:13, 1960.

    On dead herbaceous stem, Altun Ha, Belize District, 7/23/69, EFM No. 1204.

28. *Pleurophragmium simplex* (Berk. & Br.) Hughes, Can. J. Bot., 36:798, 1958.

    On dead woody branch, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1369b; On dead woody branch, Southwest Cay, Glovers Reef, Belize District, 7/27/73, (RAM), EFM No. 1572.

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    On dead woody branch, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1369a.

32. *Sporidesmium adscendens* Berkeley, Ann. Nat. Hist., 4, p. 291, 1840.

    On dead twig, Rio Frio, Cayo District, 7/22/70, (WEP) EFM No. 1304.

33. *Sporidesmium parvum* (Hughes) M.B. Ellis, Mycol. Pap., 70:69, 1958.

On dead bark, Columbian Forest, between San Jose and San Antonio, Toledo District, 7/31/70, (WEP), EFM No. 1359; On dead herbaceous stem, along w. highway, 54 miles from Belize City, Belize District, 6/28/71, (KMAL), EFM No. 1411.

34. *Sporoschisma mirabile* Berk. & Br., apud Berk. In Gard. Chron., 1847:540, 1847.

On dead palm, Columbia Forest Station, Toledo District, 7/28/70, EFM No. 1320a.

35. *Stachybotrys nilagirica* Subram., Proc. Indian Acad. Sci., 46:330, 1957.

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On dead bark, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1373.

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On dead wood, Altun Ha, Belize District, 7/19/70, (WEP), EFM No. 1302; On dead wood, Columbian Forest, between San Jose and San Antonio, Toledo District, 7/31/70, (WEP), EFM No. 1361a.

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On dead herbaceous stem, Central Farm, Cayo District, 7/25/69, EFM No. 1213; On dead bark, Belize City, Belize District, 7/5/73, (RAM), EFM No. 1505.

42. *Virgaria nigra* (Link) Nees ex S.F. Gray, Nat. Arr. Br. Pl., 1:553, 1821.

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43. *Virgatospora echinofibrosa* Finley, Mycologia, 59:538, 1967.

On dead herbaceous stem, Columbian Forest, between San Jose and San Antonio, Toledo District, 7/31/70, (WEP), EFM No. 1350; On dead bark, Columbian Forest, between San Jose and San Antonio, Toledo District, 8/1/70, (WEP), EFM No. 1378a.

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# A NEW HYPHOMYCETE ON SCLEROTIA OF SCLEROTINIA SCLEROTIORUM

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## SUMMARY

*Sporidesmium sclerotivorum*, a new dematiaceous hyphomycete on sclerotia of *Sclerotinia sclerotiorum*, is described and illustrated and its relationships are discussed.

During a study of lettuce drop disease, caused by *Sclerotinia sclerotiorum* (Lib.) deBary, an unidentified dematiaceous hyphomycete was consistently observed. The fungus was first isolated from a field at Beltsville, Maryland, and later from fields at Vineland and Cedarville, New Jersey, and from a muck field in Oswego County, New York. It appears to be a pathogen destructive to sclerotia, digesting the nonmelanized tissues within the peridium. Its potential as a biological control agent for the lettuce drop organism is great and is under study. Because this fungus cannot be placed in any presently known species, it is here described as a new species.

Names of herbaria are abbreviated in accordance with the Index Herbariorum (Holmgren and Keuken, 1974).

*Sporidesmium sclerotivorum* Uecker, Ayers, et Adams, sp.nov.

Coloniae super *Sclerotiniae sclerotiorum* sclerotia efformantes et conidiorum stratum et byssum laxum in aere effusum. Conidiophori simplices vel ramosi, erecti, leves, pallide vel sature brunnei, plerumque vel ipsi vel rami terminalese cellulis duobus vel tribus compositi, 14-25 X 4-5µm, ubi percurrentes longiores, cellula terminali rami cuiusque conidiogena. Cellulae conidiogenae integratae, holoblasticae. Conidia solitaria, cellularum conidiogenarum apices inflati orta, a prolongatione apicali elongata, pallide vel mediocriter brunnea, levia, phragmospora, apicibus rotundatis, apicem et basim versus leniter attenuata, basibus truncatis, cellula apicali atque basali mediis pallidiores, (5-)6(-7)-septatae, septis quam tunica saturioribus, 60-92 X 6-8µm.

In hyphis eisdem ac *Sporidesmii* vel sejunctis orta *Selenosporellae* fructificatio. Huius conidiophori simplices vel ramosi, (28-) 50-75 (-100)µm longi, ad basim (4-)5-7(-9)µm lati. Cellulae conidiogenae in verticillis binis, trinis, quaternis, vel quinis e conidiophoro vel eius ramulis ortae, 12-35µm longi, ad basim 4µm, apicem versus attenuatae, 1-2µm latae, parte terminali denticulas paucas vel multas conidiogenas producente. Conidia hyalina, stricta, vel fructui *Musae* forma similia vel fusiformia vel cylindrica, 7-9 X 0.8-1.0µm.

Holotypus FAU-320, BPI 71877; isotypi in DAOM, NYBG, et IMI.

Colonies forming both a loose to thick mat of conidia (Fig. 1) and loose aerial growth on sclerotia of *Sclerotinia sclerotiorum*. Mycelium both superficial and immersed, superficial mycelium pale to mid brown, cells of immersed mycelium irregular and contorted, dark brown to black. Conidiophores same diameter as hyphae or broader, simple or branched, erect, superficial, smooth, pale to dark brown, the conidiophore or its terminal branches usually consisting of two or three cells, 14-25 X 4-5µm, longer when proliferating percurrently, terminal cell of each branch conidiogenous. Conidiogenous cells integrated. Conidia single, developing holoblastically as blown-out tips of conidiogenous cells and elongating by apical extension, light to mid brown, smooth, phragmoseptate, tips rounded, tapered gently toward base and apex, base truncate, apical and basal cells paler than intermediate cells, (5-)6(-7) septate, septa darker than side walls, 60-92 X 6-8μm, germinating usually from either or both end cells but sometimes from an intermediate cell. A *Selenosporella* state developing on the same hyphae as the *Sporidesmium* state or on separate hyphae, both on the host and on other media. Conidiophores of *Selenosporella* state simple or branched, (28-)50-75(-100)μm long and (4-)5-7(-9)μm wide at base. Conidiogenous cells in whorls of two to five on the conidiophore or its branches, 12-35μm long and 4μm wide at base, tapered to 1-2μm at terminus. Terminal portion with few to many minute denticles that bear conidia. Conidia hyaline, narrow, banana-shaped to fusiform to cylindric, 7-8 X 0.9-1.0μm.

This fungus was obtained from sclerotia of *S. sclerotiorum* screened from soil and placed on moist filter paper in petri dishes. Conidia were produced both on the sclerotia and on the filter paper. For routine cultivation of the fungus in the laboratory, sclerotia grown on oatmeal and transferred to sand in petri dishes were inoculated with a suspension of conidia. The sclerotia were removed from the sand after two weeks and placed on moist filter paper. Conidia were produced in two to three weeks and continued to form for another two weeks. The fungus produces conidia rapidly and profusely on unsterilized sclerotia and much more slowly on sterilized sclerotia. It grows slowly on water agar containing ground up sclerotia of *Sclerotinia sclerotiorum,* the only medium on which it has been cultivated.

The diagnostic features of *Sporidesmium sclerotivorum* are its gently tapered, phragmoseptate conidia (Fig. 2) that form as blown-out ends of the conidiophores (Figs. 3-7); its distinctive simple (Figs. 3-7) or branched (Figs. 2,8,9) conidiophores that sometimes proliferate percurrently (Fig. 8); its possession of a *Selenosporella* state (Figs. 9-12) that differs from any previously described *Selenosporella* state; and its occurrence as a hyperparasite on sclerotia of *Sclerotinia sclerotiorum.*

This fungus belongs among the few dematiaceous hyphomycetes that produce holoblastic, phragmoseptate conidia as blown-out ends of conidiophores that proliferate percurrently through the bases of empty conidiogenous cells. When the first conidium is shed, it leaves behind the empty conidiogenous cell (Fig. 2, arrow). Successive proliferations are percurrent, i.e., the conidiophore grows through and beyond the empty conigiogenous cell. A conidium is produced on each successive proliferation of the conidiophore. Each proliferation extends through the complete septum at the base of the empty conidiogenous cell whereas in most dematiaceous hyphomycetes that proliferate percurrently only a half-septum remains when the conidium secedes. Conidiophores of *Sporidesmium subulatum* (Cke. & Ellis) Hughes, *S. inflatum* (Berk. & Rav.) M. B. Ellis, *S. flexum* Matsushima, *Teratosperma singulare* Syd., *T. cornigera* (Ell. & Ev.) M. B. Ellis, *T. pulchrum* (Ell. & Ev.) M. B. Ellis, and members of a few other genera proliferate similarly. In these, however, the conidiophores are simple and usually proliferate percurrently whereas those of *Sporidesmium sclerotivorum* are often branched and proliferate percurrently only occasionally.

In our opinion *Sporidesmium sclerotivorum* is congeneric with *S. subulatum, S. inflatum,* and *S. flexum.* The difficulty in placing this species in *Sporidesmium* is that no type or authentic material for the genus is extant (Ellis, 1958). Furthermore, in *S. subulatum* and its closest relatives proliferation of the conidiophores is percurrent through the complete septum at the base of the empty conidiogenous cell whereas in the other approximately 120 members of the genus, proliferation, if it occurs at all, is from the apical cell which bears only a half-septum. These few species probably do not belong in *Sporidesmium* but should remain there until a thorough

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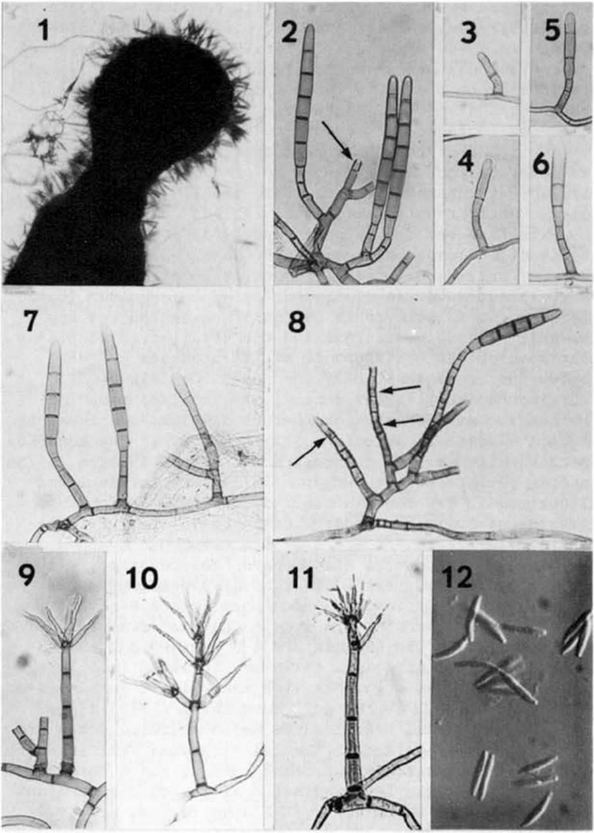
Figs. 1-12. *Sporidesmium sclerotivorum.* (All Figs. X350 unless otherwise stated.) Fig. 1, conidia on sclerotium of *Sclerotinia sclerotiorum,* X40. Fig. 2, Conidiophores with mature conidia, and empty conidiogenous cell (arrow) left when first conidium secedes. Figs. 3-7, Stages in development of conidia; 3, holoblastic conidium initial beginning to form as blown-out end of conidiophore; 4, conidium initial one-septate; 5, conidium initial two-septate; 6, larger conidium initial; 7, two conidia nearly mature. Fig. 8, conidiophores developed percurrently through empty conidiogenous cells (arrows). Figs. 9-12,



*Selenosporella* state of *Sporidesmium sclerotivorum*; 9, single whorl of conidiogenous cells on conidiophore that developed on same hypha with conidiophore of *Sporidesmium* state; 10, multiple whorls of conidiogenous cells, lower whorl branched; 11, conidia attached to conidiogenous cells; 12, conidia, interference contrast, X1000.

monographic treatment of the entire complex can place them correctly. Hughes (1971) stated his belief that *S. subulatum* would be more satisfactorily included in *Teratosperma* but did not make the transfer. *S. sclerotivorum* could also be placed in *Teratosperma* but the conidia lack the distinctive basal appendages found in all other species now included in *Teratosperma*.

None of the fungi mentioned has been reported in association with sclerotia of *Sclerotinia sclerotiorum*. Species of *Teratosperma*, however, usually are found on other fungi or on algae (Ellis, 1957).

Five species of *Selenosporella* have been described, but none has been connected with a phragmosporous hyphomycete state. Conidiogenous cells of *S. curvispora* MacGarvie (MacGarvie, 1968), *S. nandiensis* Sutton (Sutton, 1973b), and *S. acicularis* Sutton & Hodges (Sutton and Hodges, 1977) are discrete and are arranged in whorls at the apex of the conidiophore or its branches or just below the cross wall below the apex. Conidia of *S. curvispora* are slightly curved, 4-7 X 0.5μm; those of *S. nandiensis* are falcate, 10-16 X 2.5-3μm; and those of *S. acicularis* are acicular, 9.5-14.5 X 1μm. The conidiogenous cells of both *S. cymbiformis* Sutton (Sutton, 1973a) and *S. falcata* Sutton (Sutton, 1973a) are terminal and integrated. The conidia of *S. cymbiformis* are boat-shaped and 3.5-4.5μm long, whereas those of *S. falcata* are sickle-shaped and are 8.5-11 X 1.5μm.

*Selenosporella* states have been reported, without epithets, for only two fungi that have phragmosporous conidial states. In the *Selenosporella* state of *Endophragmia dimorphospora* Awao & Udagawa (Awao and Udagawa, 1974), the conidia are 6-8 X 0.5-0.8μm and the tips of the conidiogenous cells are inflated into irregularly nodulose enlargements with many minute denticles on which the conidia are borne. Matsushima (1975) illustrated but did not describe the *Selenosporella* state of *Teratosperma singulare*. The conidiogenous cell is shown with a rather short, stout basal portion and a terminal part on which four longitudinal rows of conidia develop. The conidia are shown as 16-21 X about 0.9μm, nearly straight or curved. The original description (Sydow and Sydow, 1909) did not mention a secondary conidial state for this fungus. Matsushima (1975) illustrated a *Verticicladiella* state for *Endophragmiella canadensis* (Ell. & Ev.) Sutton (erroneously cited as *Endophragmia canadensis*) but this state could be interpreted as a *Selenosporella*.

Hughes reported *Selenosporella*-like secondary conidial states in *Sporidesmium subulatum* (Hughes, 1951) and in *Ceratosporium fuscescens* Schw. (Hughes, 1964), but did not refer them to a generic name. Secondary conidia of *S. subulatum* were 10 X 0.8µm and were reported developing only from germ tubes from the apex and base of the primary conidia. Sporogenous cells bear apices roughened with minute conidial scars. In *C. fuscescens* whorled conidiogenous cells develop at or near the tip of the germinating spores or from repent hyphae, in which case they are arborescent. The conidia are 9-12.6 X 0.8µm, continuous, hyaline, curved.

Sutton (1973a) discussed the nature of the conidiogenous apparatus in *Selenosporella falcata* but could not determine whether the small pegs were produced sympodially and holoblastically or were phialides. We have also been unable to decide. The conidiogenous loci are very small and should be studied with the electron microscope.

## ACKNOWLEDGEMENTS

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# STUDIES IN THE LICHEN FAMILY PHYSCIACEAE. II
# THE GENUS *PHAEOPHYSCIA* IN NORTH AMERICA

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## SUMMARY

*The lichen genus* Phaeophyscia *Moberg is distinguished from* Physcia *by the lack of atranorin, a generally more brownish coloration, and the paraplectenchymatous lower cortex. Nineteen species of* Phaeophyscia, *including newly described* Ph. hirtella *Essl., are currently known from North America.* Physcia melanchra *Hue,* Physcia nepalensis *Poelt,* Phaeophyscia cernohorskyi *(Nádv.) Essl.,* Ph. endococcinodes *(Poelt) Essl., and* Ph. imbricata *(Vain.) Essl. are reported for the first time from North America. A key to the species of* Phaeophyscia *in North America and a discussion of each species are provided.*

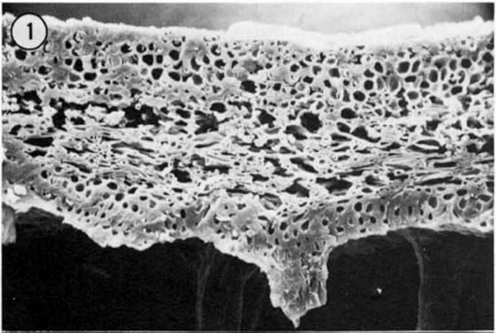
Since the time of Linnaeus and his monogeneric *Lichen*, the genus concept in lichenology has undergone a slow but steady process of narrowing and refinement. The last two decades have seen a decided acceleration of this process and the number of segregate genera recognized, particularly in such widespread macrolichen families as the Parmeliaceae and Physciaceae, is growing steadily.

Increasingly, lichenologists are acknowledging the artificiality of combining numerous, often vastly disparate species into large and cumbersome genera, sometimes based on little more than similarities in habit. An excellent example of this general trend is found in the genus *Physcia*. What was recognized only a few years ago as the single genus *Physcia* is today generally divided into five distinct genera: *Physcia, Physconia, Physciopsis, Dirinaria,* and *Pyxine.* These segregates were based on various characters involving thallus habit, anatomy of the upper and lower cortices, apothecial anatomy, spore type, conidium type, and chemistry (e.g., Poelt, 1965). The general acceptance of these segregate physcioid genera reflects a healthy trend becoming apparent throughout lichen taxonomy today.

## The Genus *Phaeophyscia* And Its Delimitation

Very recently another genus has been added to the list of *Physcia* segregates. In his fine paper on Fennoscandian *Physciae,* Moberg (1977) erected the new genus *Phaeophyscia* to encompass those species that lack atranorin and often have a brownish coloration. This delimitation corresponds approximately to what was known variously in the past as "the *Physcia orbicularis* group," or as some infrageneric taxon bearing the epithet *Obscura* (section, subsection, or "group"). In addition to the lack of atranorin and the usually brownish coloration, Moberg cited other correlative characters delimiting *Phaeophyscia* from *Physcia.* In his investigations, he found that all the brownish, atranorin-absent species possess ellipsoid conidia less than 4 µm in length while all of the gray, atranorin-present species (*Physcia* sensu stricto) possess cylindrical conidia typically greater than 4 µm in length. Because of this apparent absolute correlation, Moberg chose to emphasize conidium type in his delimitation of *Phaeophyscia.*

My own investigations with this group confirm Moberg's findings regarding the correlation of atranorin production and conidium type. However, my interpretation of the data and thus my delimitation of the genus *Phaeophyscia* differ slightly from Moberg's. The majority of the species that Moberg would include in *Phaeophyscia* (by virtue of their lack of atranorin and their ellipsoid conidia) also have distinctly paraplectenchymatous lower cortices (see Fig. 1), whereas the majority of those he would leave in *Physcia* have distinctly prosoplectenchymatous lower cortices (sensu Hale, 1975; see Fig. 2). There is one species group, however, the *Physcia luganensis* group, which is anomalous with regard to these characters. It is non-Fennoscandian and therefore not dealt with directly by Moberg, but only by implication. It is with regard to the placement of this group that my delimitation of *Phaeophyscia* differs somewhat



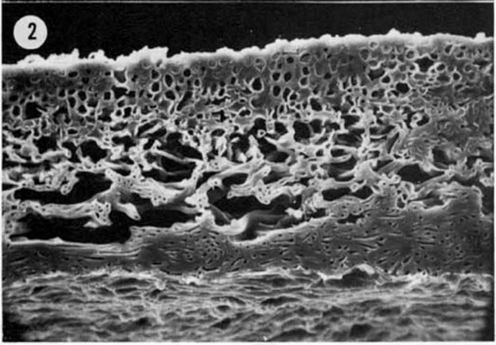


Figure 1. Scanning electron micrograph of a longitudinal section through a lobe of *Phaeophyscia pusilloides* [*Mereschkowsky* (US)], X400.

Figure 2. Scanning electron micrograph of a longitudinal section through a lobe of *Physcia luganensis* [*Wetmore 22984*(US)]

from Moberg's.

As a result of their lack of atranorin and their possession of short, ellipsoid conidia, the four related species of the *Physcia luganensis* group (including also *Physcia melanchra, Ph. nepalensis,* and *Ph. denigrata*) would be included in *Phaeophyscia* according to Moberg's delimitation. However, the four have other characters that place them closer to *Physcia* than to *Phaeophyscia*. Each has the distinctly prosoplectenchymatous lower cortex (Fig. 2) so characteristic of *Physcia* sensu stricto. Also, when fertile, the base of the apothecia lack any evidence of the "corona" of rhizines common to virtually all *Phaeophysciae*. Yet the dogmatic acceptance of conidium type as the single defining character between *Physcia* and *Phaeophyscia* would result in the unnatural placement of these four species into *Phaeophyscia*. Such placement would result, for instance, in the separation into different genera of *Physcia stellaris* (L.) Nyl. and *Ph. nepalensis*, two species nearly identical except for the production by one (the former) of atranorin. When making generic delimitations, it is necessary to consider the entire array of available characters rather than attempting to put undue emphasis on any single character, such as conidium type. At the very least, these four species form a somewhat anomalous group and no improvement would be made by transferring them to *Phaeophyscia*. Because of their superficial similarity to that genus, however, they are discussed below and are included in the key.

The following table will serve to summarize the distinguishing characteristics of the two genera *Phaeophyscia* and *Physcia* as conceived by me. As delimited here, *Physcia* still contains several anomalous groups which would fit even less well into *Phaeophyscia* (e.g., the *Physcia tribacioides* Nyl. group).

| *PHAEOPHYSCIA* | *PHYSCIA* |
|---|---|
| Lower cortex paraplectenchymatous | Lower cortex usually prosoplectenchymatous |
| Lower cortex usually black | Lower cortex usually white or tan |
| Atranorin absent; upper cortex K- | Atranorin usually present in the upper cortex and sometimes in the medulla; upper cortex usually K+ yellow |
| Medullary anthraquinones frequent | Medullary anthraquinones unknown |
| Excipular cortex often with ± darkened rhizines around base of apothecia; hyaline cortical hairs in some | Excipular cortex mostly lacking rhizines; cortical hairs lacking |

## Spore Character And Species Delimitation

Although the basic spore type for virtually all the Physciaceae appears to be the dark (gray or brown), two-celled spore, a number of variations on the theme have been described (Poelt, 1965). These variations involve primarily the relation between spore size, the size and shape of the cell lunina, and the resulting thickness of the spore wall. Such variations in spore type have been shown to be significant and useful characters for use in the delimitation of many of the genera in the Physciaceae (Poelt, 1965, 1966; Kashiwadani, 1975; Moberg, 1977). Within the genera *Physcia* and *Phaeophyscia*, the most frequently used spore character has been size differential. No consistent spore character differences exist between the two genera. However, although they were not used by Kashiwadani (1975) or Moberg (1977), two basically different and taxonomically useful types of spore are found among the various species of *Physcia* and *Phaeophyscia*:

*Physcia*-type (Figs. 3-8): This type of spore is characterized by very unevenly thickened spore walls, with the end walls and usually the adjacent walls (comprising the septum) notably thicker than the side walls. Typically the lumina of such cells are angular, the pair of lumina in a single spore then approximating an hour-glass shape. Occasionally the lumina of *Physcia*-type spores are somewhat rounded instead of angular but even then they are generally broader than they are long and the side walls are therefore decidedly thinner than the end walls.

*Pachysporaria*-type (Figs. 9-13): Spores of this type are characterized by spore walls that are only slightly unevenly thickened, the side walls being slightly or not at all thinner than the end walls. The lumina of such spores tend to be rounded and nearly isodiametric or (more often) longer than they are broad. Occasionally secondary locules will form in the walls at the opposite ends of the spores.

The existence and usefulness of these two spore types within *Physcia* (including *Phaeophyscia*) was discussed in some detail by Poelt (1974) who utilized them as species level characters, for instance, in separating *Physcia endococcina* (with *Physcia*-type spores) from *Physcia endococcinodes* (with *Pachysporaria*-type spores). My own observations have shown that species defined on other morphological and/ or chemical characters seem always to have one spore type

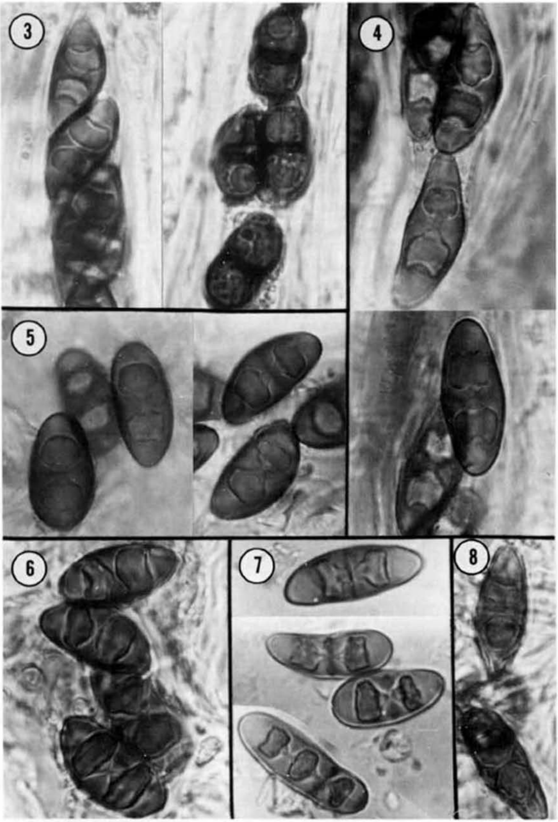


Fig. 3-8. *Physcia*-type ascospores, all X 1100. -3. *Phaeophyscia decolor*, mature (left) and postmature (right), *Esslinger 5216* (Herb. Esslinger). -4. *Ph. erythrocardia*, *Pringle 10718* (US). -5. *Ph. imbricata* from Japan, *Kashiwadani 9536* (TNS). -6. *Ph. imbricata* from North America,

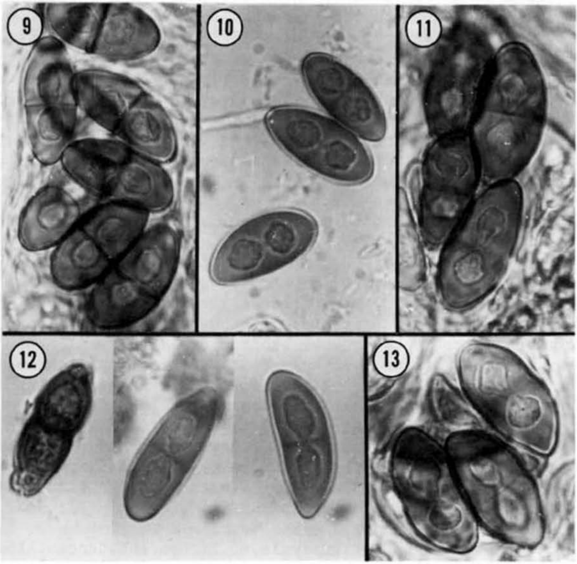


Fig. 9-13. *Pachysporaria*-type ascospores, all X1100. -9. *Physcia lacinulata, Pittier 5064* (G, lectotype). -10. *Ph. trichophora, Kashiwadani 8913* (TNS). -11 & 13. *Ph. denigrata, Asahina 32* (TNS). -12. *Phaeophyscia laciniata* Essl. ined., postmature (left) and mature, *Hale 31529* (US).

or the other(e.g., *Phaeophyscia adiastola* and *Ph. rubropulchra*; see Esslinger, 1977). In most cases other correlative characters in addition to the spore type differences can be found. I therefore support Poelt's use of spore type differences as a primary species level character difference.

*Hall 15* (FH). -7. *Ph. leana, Lea* (FH-Tuck, holotype), note the one anomalous 3-celled spore. -8. *Physcia nepalensis, Poelt L1457* (M, holotype).

Little difficulty exists in distinguishing between typical, mature spores of the *Physcia*- and *Pachysporaria*-types. As pointed out by Poelt (1974), however, the spores of each type go through a series of premature and postmature stages in which they can be difficult or impossible to distinguish. The premature spores are usually easy to recognize by their smaller size and paler color; the postmature spores by their generally darker (more brown than gray) color and generally irregular appearance (see Figs. 3 & 12 in this paper and Poelt's Fig. 1). Premature and postmature spores are almost always in a definite minority in a given apothecial section.

## Chemistry

The Physciaceae, and especially the genera *Physcia* and *Phaeophyscia*, exhibit far less of the diversity of different substances found in some other macrolichen families (e.g., the Parmeliaceae), however most species are characterized by a constant chemistry (or lack thereof). With the exception of atranorin, no depsides or depsidones are known in either of these two genera. Characteristic substances include anthraquinones, fatty acids, and terpenoid compounds such as zeorin. All chemical analyses for this paper were performed using thin-layer chromatographic procedures essentially as described by Culberson (1972).

When using TLC for analysis of lichen substances, low concentrations of the chemicals within the lichen thallus can often cause difficulties in interpretation. In *Physcia* and *Phaeophyscia* this seems especially to be a problem with regard to the terpenoid compounds. While some species (e.g., *Ph. decolor*) produce significant and easily detected amounts of zeorin or other terpenoids, other species are more difficult. Among the species reported in this paper as containing no lichen substances, virtually every one on occasion exhibited unidentifiable terpenoids, usually in very faint traces and usually non-repetitively. Under such circumstances it is difficult to be absolutely certain of the true origin of the substances and they therefore have not been reported.

## Key To The North American Members Of *Phaeophyscia* (and K- *Physciae*)

1. Lobes mostly 2-4 (-5.5) mm broad, flat to more often somewhat concave, especially near the upturned lobe

tips; thalli relatively large (up to 14 cm diameter), usually with numerous, long (often 2 mm or more) black rhizines on the lower surface and projecting outward and often upward from the margin; with or without soredia or isidia................. *Phaeophyscia hispidula*

1. Lobes mostly less than 1.5 mm broad (rarely to 3 mm), more or less flat or occasionally somewhat concave; thalli relatively small (mostly less than 5 cm, rarely up to 10 cm), lower surface with few to many rhizines (mostly 1 mm or less, never over 2 mm) which are seldom conspicuous from above (exceptions: *Ph. pusilloides*, *Ph. kairamoi*)........................................ 2
   2. Thallus without soredia, isidia or lobules, primarily sexual (fertile) species.......................... 3
   2. Thallus bearing soredia, isidia or lobules, primarily asexual (sterile) species....................... 11
3. Lower surface dark brown to black, with fairly numerous black rhizines........................................ 4
3. Lower surface white to pale tan or very pale brown, with sparse concolorous rhizines...................... 9
   4. Apothecial margin and the tips or margins of lobes with small, pale (rarely darkening) cortical hairs (Note: all species of *Phaeophyscia* may have a "corona" of dark or black rhizines around the base of the apothecia; these should not be confused with the cortical hairs which occur on both the upper part as well as the lower parts of the exciple).......... ........................... *Phaeophyscia hirtella*
   4. Apothecial margins and lobe margins lacking small, pale cortical hairs.................................. 5
5. Medulla pigmented red (skyrin)........................ 6
5. Medulla not pigmented, white.......................... 8
   6. Ascospores of the *Pachysporaria*-type, with rounded to elongate lumina and relatively thick walls (Figs. 9-13)...................... *Phaeophyscia endococcinodes*
   6. Ascospores of the *Physcia*-type, with angular to somewhat rounded (but generally broader than long) lumina and thinner side walls (Figs. 3-8)................ 7
7. Amphithecial cortex of smaller cells, 3-7 (-10) µm in diameter; lobes flat, ca. 1 mm broad, gray or gray-brown; on bark or on mosses over rock................. ......................... *Phaeophyscia erythrocardia*
7. Amphithecial cortex of larger cells, 6-12 (-15) µm in diameter; lobes flat to weakly convex, mostly 0.5 mm broad or less, brown; on rock. *Phaeophyscia endococcina*
   8. Amphithecial cortex of smaller cells, 3-6 (-8) µm in diameter; lobes flat, mostly 0.5-1.5 mm broad (some

forms only ca. 0.2-0.3 mm), gray or gray-brown; on bark or mosses over rock, rarely on rock.......................................... *Phaeophyscia ciliata*

8. Amphithecial cortex of larger cells, 6-10 (-12) µm in diameter; lobes flat to weakly convex, mostly 0.5 mm broad or less, brown; on rock... *Phaeophyscia decolor*

9. Thallus of numerous, crowded ("turf-like"), long and narrow, mostly ascending lobes; generally on soil or mosses in arctic or alpine localities.................................................. *Phaeophyscia constipata*

9. Thallus prostrate and adnate; generally on bark, more southern............................................. 10

10. Lower cortex paraplectenchymatous; eastern, very.... rare.......................... *Phaeophyscia leana*

10. Lower cortex prosoplectenchymatous; western, rare... ............................ *Physcia nepalensis*

11. Medulla pegmented bright red, K+ violet (skyrin)...... ......................... *Phaeophyscia rubropulchra*

11. Medulla white...................................... 12

12. Thallus with many small, ± erect lobules, primarily on the lobe margins......... *Phaeophyscia imbricata*

12. Thallus with soredia, isidioid soredia or isidia. 13

13. Thallus with small, pale (or occasionally darkening) cortical hairs, especially on young lobe tips, on apothecial margins or (in *Ph. kairamoi*) on the isidia or soredia............................................ 14

13. Thallus without cortical hairs...................... 16

14. Soralia marginal, with very granular isidioid soredia or isidia bearing sparse pale or darkening hairs ........................... *Phaeophyscia kairamoi*

14. Soralia marginal or terminal, the soredia more finely granular, not isidioid and lacking hairs...... 15

15. Soralia labriform, mostly terminal on somewhat upright lobes, occasionally also marginal *Phaeophyscia hirsuta*

15. Soralia marginal, not labriform, usually distinctly elongate.................. *Phaeophyscia cernohorskyi*

16. Lower surface dark brown to black throughout or at least in the older, central parts, sometimes very pale marginally; lower cortex paraplectenchymatous (see also *Ph. nigricans* below).................. 17

16. Lower surface white to tan or very pale brownish. 20

17. Thallus with darkened, marginal or occasionally laminal, strongly isidioid soredia or isidia; lobes narrow, mostly less than 0.5 mm broad; saxicolous............ ............................. *Phaeophyscia sciastra*

17. Thallus with finely granular to weakly isidioid soredia; lobes mostly broader than 0.5 mm............... 18

18. Soralia capitate, primarily terminal on main lobes or on small lateral lobes, often appearing distinctly stipitate due to the ascending nature of the lobes.................... *Phaeophyscia pusilloides*
18. Soralia marginal, laminal or terminal, but not strongly capitate or stipitate................. 19
19. Soralia primarily laminal and submarginal, the soredia mostly finely granular....... *Phaeophyscia orbicularis*
19. Soralia primarily terminal and marginal, the soredia coarsely granular to isidioid.. *Phaeophyscia adiastola*
20. Lobes very narrow and linear, mostly less than 0.4 mm broad, with sparse granular soredia or isidia on some lobe tips or margins; lower cortex paraplectenchymatous.................. *Phaeophyscia nigricans*
20. Lobes broader, mostly over 0.4 mm broad, with discrete laminal, marginal or terminal soralia; lower cortex prosoplectenchymatous.................... 21
21. Soralia marginal or terminal, distinctly labriform.... .................................. *Physcia luganensis*
21. Soralia primarily laminal or submarginal, rounded to irregular in shape................. *Physcia melanchra*

*PHAEOPHYSCIA ADIASTOLA* (Essl.) Essl., comb. nov.

Basionym: *Physcia adiastola* Essl, Mycotaxon 5: 299. 1977.

Until recently (Esslinger, 1977) this species was confused with *Ph. orbicularis* from which it differs by the larger and more granular (mostly 60-90 µm in diameter) soredia which are located in irregular, marginal or terminal soralia. In *Ph. orbicularis* the soredia are mostly 40-60 µm in diameter and are located in punctiform to irregular, laminal and submarginal soralia. *Phaeophyscia adiastola* is largely eastern (west to South Dakota) and *Ph. orbicularis* is largely western (east to Minnesota). The ascospores of *Ph. adiastola* are of the *Physcia*-type [(15-)17-23(-25) x 6-9.5 µm]. Another similar species is *Ph. rubropulchra* which can easily be distinguished by the red medulla (skyrin) and the larger spores of the *Pachysporaria*-type. *Phaeophyscia adiastola* is most common on mosses over rock, but grows also directly on rock or bark. See Esslinger (1977) for further discussion of these three species.

Chemistry: All spot tests negative. No substances detected by TLC.

No specimens will be cited; see the distribution map accompanying the protologue.

*PHAEOPHYSCIA CERNOHORSKYI* (Nádv.) Essl., comb. nov.

Basionym: *Physcia cernohorskyi* Nádv., Stud. Bot. Čech. 8: 98. 1947. Type: Czechoslovakia: in colle Velka hora prope pag. Karluv Tyn (=Karlstejn), calcicola, 350 m., *Černohorský*, 2.7.1941 (BRA, lectotype, selected here).

Synonym: *Physcia strigosa* Poelt et Buschardt in Poelt, Portug. Acta Biol. (B)12: 195. 1973. Type: Austria: Südtirol, Vinschgau, Laatsch, ca. 1100 m., *Buschardt 756* (GZU).

In North America this taxon has long been included (along with several others) in the concept of *Ph. orbicularis*; Thomson (1963) recognized it as the f. *albociliata* of that species. *Phaeophyscia cernohorskyi* differs from *Ph. orbicularis* in several characters, however. Except in highly eroded or mistreated specimens, small hyaline or pale (rarely darkening) cortical hairs can readily be seen on the upper surface of the lobe ends and (when fertile) on the apothecial margins. The soralia are mostly marginal, varying from short to often more or less linear. Laminal soralia are sometimes present also, although fewer in number. In most specimens the upper surface is distinctly maculate (white spotted), especially inward. *Phaeophyscia orbicularis*, on the other hand, is mostly emaculate, lacks cortical hairs, and has laminal to submarginal soralia.

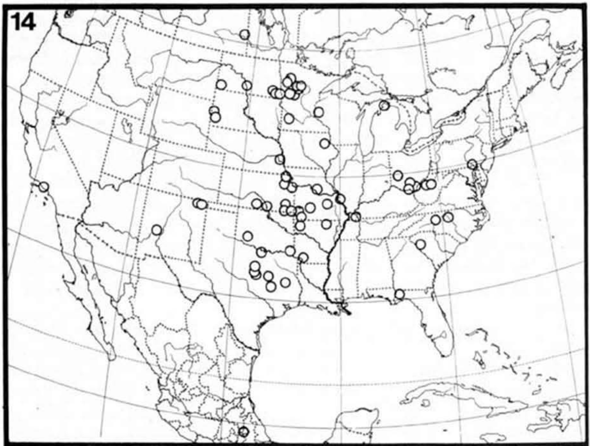
Cortical hairs like those of *Ph. cernohorskyi* occur in three other North American species (*Ph. hirsuta, Ph. hirtella, Ph. kairamoi*). They occur on the lobe ends (in all four species but less numerous in *Ph. kairamoi*), on the apothecial margin (in all four species), and on the isidia (of *Ph. kairamoi* only). When on the apothecial margin, they occur over its entire surface, particularly the upper part, however, and they should therefore not be confused with the rhizines which may ring the base of the apothecia in all species of *Phaeophyscia* (not all specimens of a given species have sucha a "corona" of rhizines on the apothecia, but many or most do). Although the degree of development of the cortical hairs in these species is variable (e.g. see *Ph. hirsuta*), they appear to be good characters for delimitation of species. In most cases, additional correlative characters are found separating them from similar "hairless" species.

The cortical hairs and mostly linear marginal soralia are diagnostic for *Ph. cernohorskyi*. If one overlooks the soredia (because of erosion, etc.) this species, especially when fertile, might easily be mistaken for *Ph. hirtella*, the fertile, nonsorediate counterpart. Like that species, the ascospores of *Ph. cernohorskyi* are of the *Physcia*-type [(15-)20-25 x 7-11(-14) µm]. Another closely related species is the much rarer (in North America) *Ph. hirsuta* which has similar cortical hairs but mostly terminal, labriform soralia and emaculate lobes. *Phaeophyscia kairamoi* also has cortical hairs and marginal soralia, but the soredia are more granular to strongly isidioid (see discussion of isidia under *Ph. sciastra*) and they bear the same small cortical hairs that are present on the lobe ends.

This species is widespread in North America. The map (Fig. 14) shows the distribution based on all specimens in US DUKE, FH, and my personal herbarium. Relatively few specimens of *Phaeophyscia* were seen from western North America (particularly from the Southwest) and this species may well prove to be more widespread there than indicated by the map.

The correct name to be used for this taxon has been in doubt. Poelt (1957), based on material sent to him by Nádvornik (Poelt, pers. comm.), interpreted *Ph. cernohorskyi* as having labriform soralia and he therefore treated it as a synonym of *Ph. hirsuta*. Later (Poelt, 1973), he and Buschardt described *Ph. strigosa* to accommodate the taxon with marginal, non-labriform soralia. However, the specimens in Nádvornik's herbarium at Bratislava (BRA) do not support this treatment. Thanks to the kindness of Dr. Ivan Pišút, the Curator at Bratislava, I have had the opportunity to study all specimens of *Ph. cernohorskyi* presently in the Nádvornik herbarium. Of the eleven specimens present, only five are from among those cited by Nádvornik in the protologue (syntypes) and it is from these that a lectotype must be selected. Although several of these are so fragmentary that any positive determination is difficult, all five (and especially the three good, intact specimens) have marginal or laminal, short to more or less linear (non-labriform!) soralia. It is therefore not possible to consider *Ph. cernohorskyi* to be a synonym of *Ph. hirsuta;* the name *Ph. cernohorskyi* takes priority over *Ph. strigosa* as the correct name for this taxon.

The specimen selected as a lectotype is one of the better developed of the five available syntypes. It is also the only specimen of the entire eleven examined (from Nádvornik's herbarium) that is marked, in Nádvornik's hand, "spec. orig.," and it therefore seems the most appropriate choice. It consists of three or four small, partly overlapping thalli in the center of a small piece of rock. All lobes are distinctly appressed and the soralia are laminal



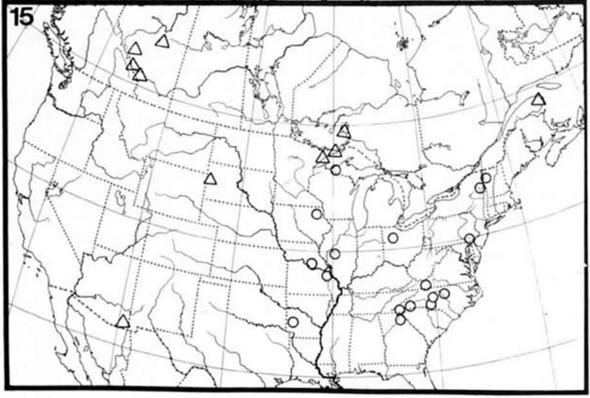


Figure 14. North American distribution of *Phaeophyscia cernohorskyi*.

Figure 15. North American distribution of *Phaeophyscia imbricata* (○) and *Phaeophyscia kairamoi* (△).

or largely marginal, punctiform to elongate, but definitely not labriform as in true *Ph. hirsuta*. The upper surface of the specimen is darker than usual, including the somewhat darkened cartical hairs, and the characteristic maculation is therefore more obscure than normal. This collection also has several thalli of *Ph. orbicularis* around and partly intermixed with the *Ph. cernohorskyi* but the protologue makes it clear to which material Nādvornik referred the name.

Chemistry: All spot tests negative. No substances detected by TLC.

No further specimens will be cited; see the distribution map (Fig. 14).

*PHAEOPHYSCIA CILIATA* (Hoffm.) Moberg, 1977: 30.

Basionym: *Lichen ciliatus* Hoffm., Enumeration Lichenum: 69. 1784.

This is one of the more common members of the genus *Phaeophyscia* in North America. The relatively small thalli (usually less than 4 cm) with narrow lobes [(0.2-) 0.5-1.5(-2) mm broad], the dark or black lower surface, the white medulla, and the lack of cortical hairs or asexual propagula will distinguish this from all other taxa included in this paper. *Phaeophyscia hirtella* (q.v.) is similar but differs by the presence of cortical hairs on lobe tips and apothecial margins, and in the generally maculate upper surface. While *Ph. ciliata* generally occurs on bark or on mosses over rock, related *Ph. decolor* is saxicolous and generally smaller (see discussion under that species). Some forms of *Physciopsis syncolla* (Tuck.) Poelt can appear very similar to *Phaeophyscia ciliata* but that species is much more closely appressed to the bark substrate (often difficult to remove for purposes of examining the lower surface), the lower surface is tan to blackening, and rhizines are few and poorly developed (virtually absent). All members of the genus *Physciopsis* have filiform conidia 10 µm or more in length, contrasting with the ellipsoid to fusiform conidia (4 µm or less) *of Phaeophyscia* species. The ascospores of *Ph. ciliata* are of the *Physcia*-type [(15-)17-22(-24) x 7-10 µm].

Chemistry: All spot tests negative. No substances detected by TLC (or, very rarely, a slight trace of zeorin).

Representative specimens: Arkansas. Montgomery Co.: Black Springs, *Hale 3905* (US). California. Mariposa Co.: Yosemite Valley, *Bolander*, 1867 (FH). Florida. Walton Co.: Glendale, *Moore 4859* (DUKE). Iowa. Fayette Co.: Echo Valley State Park, *Wetmore 13642* (DUKE). Kansas.

Leavenworth Co.: County Park, *Hale 4574* (US). Kentucky. Mason Co.: 7 mi. E of Germantown, *Culberson 655* (DUKE). Louisiana, *Hale*, 1851 (FH). Maine. Aroostook Co.: Portage, *Riddle*, 1907 (FH). Massachusetts. Berkshire Co.: Lanesboro, *Riddle*, 1910 (FH). Minnesota. Otter Tail Co.: Maplewood State Park, *Esslinger 5129* (herb. Esslinger). Mississippi. Jones Co.: Indian Springs, *Sierk 1083* (US). Missouri. Cooper Co.: 2 mi. NE of Clifton City, *Shoop 429* (US). New Hampshire. Grafton Co.: Warren, *Riddle*, 1906 (FH). New Mexico, Santa Fe Canyon, *Arsène 20520* (US, FH). New York, *Peck*, 1868 (FH). North Carolina. Brunswick Co.: 3.5 mi. NW of Dulah, *Esslinger 2838* (herb. Esslinger). North Dakota. Richland Co.: 5.5 mi. E of Mcleod, *Esslinger 4909A* (herb. Esslinger). Ohio. Franklin Co.: Columbus, *Bogue*, 1893 (US, FH, DUKE). South Carolina. Chester Co.: Chester, *Green*, 1898 (DUKE, US, FH). Tennessee. Hamilton Co.: Chattanooga, *Calkins 304* (US). Texas. Johnson Co.: Cleburne State Park, *Sierk 2063* (DUKE). Utah. Wasatch Co.: 10.4 mi. E of Springville, *Wetmore 16540* (DUKE). Vermont. Chittenden Co.: Charlotte, *Riddle*, 1908 (FH). Virginia. Greensville Co.: 5 mi. E of Emporia, *Luttrell & Allman 1615* (US). Wisconsin. Dane Co.: Albion, *Greene*, 1863 (FH).

*PHAEOPHYSCIA CONSTIPATA* (Norrl. et Nyl.) Moberg, 1977: 33.
Basionym: *Physcia constipata* Norrl. et Nyl., Herb. Lich. Fenn. Exs. 218. 1882 (Not seen). [As nom. nov. for *Physcia ulothrix * subciliaris* Nyl. in Norrl., Medd. Soc. F. Fl. Fenn. 1: 20. 1876 (Not seen).]

This species is one of a small number of North American *Phaeophyscia* species that have a pale lower surface (although still paraplectenchymatous). The numerous, usually much divided ascending lobes [0.5-1 (-2) mm broad] and the habitat (on soil or on mosses over rock) will distinguish it from *Ph. leana* and *Ph. nigricans*, the other species with pale lower surfaces. The lobes are relatively thick (up to 300 µm) and the narrower more divided segments may appear almost terete (though irregular) and thus subfruticose. The lower surface bears sparse, mostly marginal, pale to darkening rhizines ("cilia") and often bears low warts containing algae like those under the upper cortex. American specimens particularly (but also some European ones), sometimes have a pale yellow to yellowish-orange pigment scattered on some parts of the lower surface and on rhizines. The pigment is K+ violet and apparently is an anthraquinone but is present in such low concentrations that chromatographic identification proved impossible. The presence of such a pigment is interesting, however, because it supports inclusion of this and other species with pale lower surfaces in *Phaeophyscia*. Apothecia were not seen.

Although unlikely to be mistaken for other *Phaeophysciae*, this species has in the past been confused with members of the genus *Anaptychia*, particularly *A. bryorum* Poelt (Poelt, 1971). Although superficially similar, *A. bryorum* can be distinguished from *Ph. constipata* by its prosoplectenchymatous upper cortex.

Chemistry: All spot tests negative (except when the pigment described above is present on the lower surface). No substances detected by TLC (but see above).

Representative specimens: Colorado. Jefferson Co.: between Plainview & Eldorado Springs, *Weber & Anderson*, L-36338 (DUKE); Boulder Co.: 2 mi. W of Boulder, *Weber*, S4727A (DUKE). Alberta: 1.5 mi. above Fort Saskatchewan, *Turner*, 1958 (DUKE); 1.5 mi. W of Fort Saskatchewan, *Turner 10251* (DUKE).

*PHAEOPHYSCIA DECOLOR* (Kashiwadani) Essl., comb. nov.

Basionym: *Physcia decolor* Kashiwadani, Ginkgoana 3: 42. 1975.

The existence of two similar saxicolous taxa, one with a white medulla (*Ph. decolor*) and one with a red medulla (*Ph. endococcina*) has been recognized for quite some time but general agreement has not been reached regarding the appropriate status at which they should be recognized. The two most recent authors have taken opposite viewpoints. While Kashiwadani (1975) recognized the two as distinct species, Moberg (1977) concluded the two were undeserving of any taxonomic recognition whatsoever. Moberg based his opinion on the lack of any correlative morphological characters and the fact that, in his view, some thalli had a red medulla (i.e., contained skyrin) in one part but lacked it in another part. I have had the opportunity to examine only a small number of specimens of the two species and will therefore reserve final judgement until more specimens are available. For the time being I choose to recognize the two as distinct species, for the following reasons. In all other *Phaeophysciae* with which I am familiar, the presence or absence of skyrin in the medulla is a significant species character (although concentrations do vary at times, especially in the lobe ends). Also, from personal experience I know that the intricate intermixtures of two or more species that often occur in this genus can easily cause confusion regarding variability and delimitation of a species.

*Phaeophyscia decolor* is uncommon in North America but can be distinguished from other North American *Phaeophysciae* by the narrow lobes (mostly 0.2-0.5 mm broad, but up to 1 mm), dark color (gray-brown to dark brown, often with a scattered necrotic pruina), and saxicolous habitat. Occasional specimens of *Ph. sciastra* with sparse or no isidia appear very similar but can be distinguished by their lack of zeorin in TLC tests. The two sometimes grow together and must be carefully separated for TLC analysis. Infrequent darkened and saxicolous specimens of *Ph. ciliata* can appear very similar but that species also lacks significant quantities of zeorin. The character of the cells in the amphithecial cortex will also distinguish *Ph. decolor* and *Ph. ciliata* (see the key), but that character is notoriously difficult to use. The ascospores of *Physcia decolor* are of the *Physcia*-type [(15-)17-23(-27) x 8-10.5 µm] (Fig. 3).

Chemistry: All spot tests negative. Zeorin by TLC.

Specimens examined: California. Mariposa Co.: Yosemite National Park, *Hale 50088* (US). Colorado. Boulder Co.: 1 mi. NE of Gold Hill along Lefthand Creek, *Wetmore 16093* (US); Montrose Co.: W end of Paradox Valley, below Buckeye Reservoir, *Weber et al.*, L31312 (DUKE). Idaho. Blaine Co.: Wood River Campground, Sawtooth Rec. Area, *Hale 50092* (US). Montana. Lincoln Co.: 6 mi. E of Troy, *Hale 48159* (US), Pete Creek Campground, Yaak River Road, *Hale 48637* (US); Missoula Co.: 2 mi. SW of Lee Creek Campground after leaving Lolo Hot Springs, *Hale 49997* (US). Washington. Spokane Co.: Dishman Hills, *Esslinger 5216* (herb. Esslinger).

*PHAEOPHYSCIA ENDOCOCCINA* (Korb.) Moberg, 1977: 35.

Basionym: *Parmelia endococcina* Korb., Parerga Lichenologica: 36. 1865.

This saxicolous species is very close to *Ph. decolor*, differing primarily by the presence of skyrin in the medulla (see discussion under that species). Other similar North American species are *Ph. endococcinodes* with *Pachysporaria*-type spores and *Ph. erythrocardia* with broader lobed, paler thalli and with the cells of the amphithecial cortex smaller (see the key). The ascospores of *Ph. endococcina* are of the *Physcia*-type [17-22 x 8-11.5 µm]. According to Thomson (1963) the form with the colored medulla (*Ph. endococcina*) is less common in North America than the form with the white medulla (*Ph. decolor*). I have as of yet seen no authentic North American specimens of this species, but only misidentified specimens of *Ph. endococ-*

*inodes*. The non-North American specimens examined are therefore the only ones cited.

Chemistry: Medulla K+ purple. Skyrin and zeorin by TLC.

Specimens examined: Austria. Steiermark: Niedere Tauern, Donnersbachwald bei der Morsbachhütte, *Putzler*, 1954 (DUKE), *Klement*, 1954 (DUKE). Czechoslovakia. Bohemoslovakia: Tatra Minor, Latiborská hola, in valle Biela voda, *Vězda*, 1966 (DUKE). Rumania. Transylvania: infra montem Retyezát, *Lojka*, 1872 (DUKE). Sweden. Värmland: Rämen, *Lagergren*, 1868 (DUKE).

*PHAEOPHYSCIA ENDOCOCCINODES* (Poelt) Essl., comb. nov.

Basionym: *Physcia endococcinodes* Poelt, Khumbu Himal 6: 77. 1974. Type: Khumbu-Gebiet, Pheriche, ± 4250 m, *Poelt L385* (M, holotype).

This saxicolous species, only recently described by Poelt (1974), was previously included in the concept of *Ph. endococcina*. The two are very similar in most respects, the most distinctive difference being the *Pachysporaria*-type spores of *Ph. endococcinodes* [18-24(-27) x 9-12 µm in North American material, up to 32 µm long in some others] against the *Physcia*-type spores of *Ph. endococcina*. Other differences occur but are less absolute. Apothecia of both species may be crenate to lobulate but the lobules are more often strongly developed in *Ph. endococcinodes*. Also, although the anthraquinone skyrin is common to both, the zeorin found consistently in *Ph. endococcina* is absent or present in only trace amounts in *Ph. endococcinodes*.

This species seems to have a south temperate-tropical montane distribution, and is known in North America from as far north as Arizona. The species was previously reported only from the Himalyas and so non-North American material is cited below also.

Chemistry: Medulla K+ purple. Skyrin and sometimes also a trace of zeorin by TLC.

Representative specimens: Arizona. Cochise Co.: Chiricahua Mtns., *Nash 7020* (DUKE). Hawaii. Maui Co.: crater of Haleakala, *Forbes 1308m* (herb. Esslinger). Mexico. Morelos: near Cuernavaca, *Pringle 15380, 15387* (FH). Panama. Prov. Chiriqui: Volcan Chiriqui, *Esslinger 4525* (herb. Esslinger). Colombia: Bogota, *Lindig 2936* (FH). China. Fukien Prov.: Kushan near Foochow, *Chung F259* (FH). India. Tamil Nadu: Kodaikanal, Palni Hills, *Hale 43879* (US). Japan. Prov. Musashi: Mt. Ryogami, *Suzuki 294* (TNS), Mt. Buko, *Asahina 30, 169* (TNS), Mt. Takao, *Hashimoto*, 1932 (TNS). Sabah: Kinabalu National Park, along Mesilau Trail, *Hale 28297* (US), near R. S. campsite, E. Mesilau River, *Hale 28446* (US). Rumania. Transylvania: com. Hunyas, infra alpem Retyezát, *Lojka*, 1872 (DUKE).

*PHAEOPHYSCIA ERYTHROCARDIA* (Tuck.) Essl., comb. nov.

Basionym: *Physcia obscura* var. *erythrocardia* Tuck., Proc. Amer. Acad. Arts Sci. 4: 399. 1860.

Synonym: *Physcia erythrocardia* (Tuck.) Kashiwadani, Ginkgoana 3: 44. 1975.

This taxon is closely related to *Ph. ciliata*, differing primarily by the presence of skyrin and zeorin in the medulla. It would be most likely to be confused with *Ph. endococcinodes* or *Ph. endococcina*, two saxicolous species with similarly red pigmented medullas. Both are darker and generally narrower lobed. The cells of the amphithecial cortex in *Ph. erythrocardia* are smaller (mostly 3-7 µm) than those of *Ph. endococcina* and *Ph. endococcinodes* (mostly 6-12 µm). Also the spores of *Ph. endococcinodes* are *Pachysporaria*-type while those of *Ph. erythrocardia* are *Physcia*-type [20-25(-28) x 9.5-12(-13) µm] (Fig. 4).

Chemistry: Medulla K+ purple. Skyrin and zeorin by TLC.

Specimens examined: Minnesota. Koochiching Co.: Rainy Lake City, along or near the International Boundary, *Fink*, 1901 (DUKE, FH). Mexico. Federal Dist.: La Cima, *Pringle 10718* (US, FH).

*PHAEOPHYSCIA HIRSUTA* (Meresch.) Essl., comb. nov.

Basionym: *Physcia hirsuta* Meresch., Ann. Conserv. Jard. Bot. Genève 21: 181. 1919. Type: Switzerland. Ticino: Lugano, *Mereschkowsky*, 1919 (US, FH, syntypes).

Synonym: *Physcia labrata* Meresch., Ann. Conserv. Jard. Bot. Genève 21: 183. 1919. Type: Switzerland. Ticino: Lugano, *Mereschkowsky*, 1919 (US, FH, syntypes).

*Phaeophyscia hirsuta* is one of the less common members of this genus in North America although undoubtedly more widespread, especially in the Southwest, than the few collections cited below would indicate. It is a small and easily overlooked species. The diagnostic features are the pale cortical hairs and the terminal, labriform soralia. The thallus often consists of numerous, more or less separate ascending lobes bearing labriform soralia and cortical hairs. At other times a more rosette-form thallus is produced. The species most likely to be confused with *Ph. hirsuta* is *Ph. cernohorskyi* which differs, however, in having laminal and marginal, often linear soralia. Also the distinct maculation on the upper surface of *Ph. cernohorskyi* is absent in the often slightly darker *Ph. hirsuta*. The ascospores of *Ph. hirsuta* are *Physcia*-type [(16.5-)18-22.5 x 6-9.5 µm] although the spore lumina in some specimens (e.g., the North Dakota specimens) become more elongate and rounded than usual.

Of the species of *Phaeophyscia* with cortical hairs, *Ph. hirsuta* seems the most variable with regard to their production. They were found to be sparse in several of the North American specimens cited below (present only on a few lobes), and missing entirely in one (*Standley 14762*). The type material of *Ph. labrata* Meresch. (cited above) consists partly of such "hairless" *Ph. hirsuta* also (Moberg, 1975). It may be significant that all specimens with few or no hairs seen by me were old and rather scrappy . The cortical hairs are delicate and their absence (or rarity) in such specimens might be partially explained by mistreatment or abrasion.

Occasional specimens of *Ph. hirsuta* are largely pale on the lower surface, darkening only here or there in older parts of the thallus. Such specimens can easily be confused with *Physcia luganensis* (q.v.), especially if the cortical hairs are overlooked or missing as described above.

Chemistry: All spot tests negative. Occasional trace of zeorin by TLC.

Specimens examined: California. Los Angeles Co.: San Gabriel Mts., Eaton Canyon, *Moxley 635* (FH). Colorado. El Paso Co.: Palmer Lake, *Laidig 8* (FH). New Mexico. Colfax Co.: vicinity of Ute Park, *Standley 14762* (FH). North Dakota. Burleigh Co.: ca. 13 mi. SW of Bismarck, *Esslinger 5580, 5582* (herb. Esslinger); Dunn Co.: Little Missoure State Primitive Park, *Esslinger 5869* (herb. Esslinger); Slope Co.: 6.5 mi. N and 9 mi. W of Amidon, *Esslinger 5710* (herb. Esslinger). Texas, *Wright s.n.* (FH). Mexico. Coahuila: 27 km below Piedras Negras on the Monterey Hwy., *Bell*, 1965 (DUKE); Jalisco: 12 km from Zapotlanejo, *Bell*, 1965 (DUKE).

*PHAEOPHYSCIA HIRTELLA* Essl., sp. nov. Fig. 16

*Phaeophyscia ciliata* subsimulans sed loborum apicem versus et ad marginem apotheciorum pilis minutis erectisque albicantibus obtecta.

Type: Minnesota. Clearwater Co.: Itasca State Park, Univ. of Minnesota Biological Station, along Professor Green Trail, *Hale 23423* (DUKE, holotype).

Thallus greenish gray to darker gray or occasionally somewhat brownish, 1-3(-4) cm in diameter, generally more or less orbicular. Lobes dichotomously or irregularly branched, irregularly rounded to more or less linear, usually flat, (0.3-)0.5-1(-1.5) mm broad, with sparse to numerous, pale or almost hyaline cortical hairs, especially on the lobe ends and/or margins, the upper surface often distinctly white maculate. Without soredia or isidia. Lower surface black, sometimes paler on the lobe-ends, with rather numerous black rhizines, mostly ca. 0.5 mm in length. Apothecia numerous, mostly 0.8-1.5(-3) mm in diameter, often with darkened rhizines around the base, the upper part of the exciple bearing pale (or rarely somewhat darkened) cortical hairs 50-200(-350) µm in length (like those on the lobe tips); ascospores 18-22.5 x 8-10 µm, of the *Physcia*-type. Both the upper and lower cortices are paraplectenchymatous and leptodermatous; medulla white.

Thomson (1963) recognized this taxon as a minor variant of *Ph. ciliata* (f. *fibrillosa* Thoms.). The two species are closely related and, since they often grow intermixed on the same branch, can be easily confused. However, here as elsewhere in *Phaeophyscia*, the presence or absence of cortical hairs is generally correlated with other characters, and seems to be a good species character. *Phaeophyscia ciliata* differs from *Ph. hirtella* in lacking the cortical hairs and the maculations on the upper surface, and in its broader distribution. Like *Ph. ciliata*, *Ph. hirtella* is primarily a corticolous species.

Another species that might be confused with *Ph. hirtella* is the Asian species, *Phaeophyscia hirtuosa* (Krempelh.) Essl.* The latter species also bears hyaline or darkening hairs on the apothecia although these usually average longer (often 200-300 or up to 500 µm in length) and coarser than those of *Ph. hirtella*. Also, *Ph. hirtuosa* lacks cortical hairs on the lobe ends. In general, *Ph. hirtuosa* is a larger, coarser species (thallus size up to 6 or 7 cm, lobe width generally 1-3 mm, apothecia commonly to 3 or 4 mm across), more closely resembling *Ph. hispidula* than *Ph. hirtella* or *Ph. ciliata*.

Chemistry: All spot tests negative. No substances detected by TLC.

Representative specimens: Arkansas. Crittenden Co.:

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* *Phaeophyscia hirtuosa* (Krempelh.) Essl., comb. nov. Basionym: *Physcia hirtuosa* Krempelh., Flora 56: 470. 1873. Type: China. Shanghay u. Wampoa, *Rabenhorst*, 1871 (FH, isotype).

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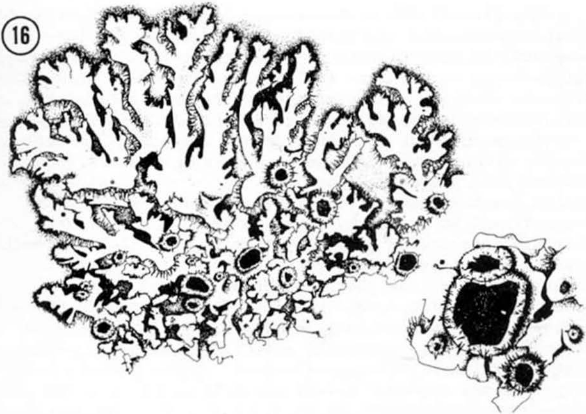

Figure 16. Drawing of a portion of a thallus of *Phaeophyscia hirtella* (X 5) and a closeup (insert) of several apothecia (X 13); *Johnson 53* (herb. Esslinger). Drawing by Laurie Friese.

no locality, *Peters*, 1878 (FH). Maryland. Anne Arundel Co.: Robinson's Forest Home, *Plitt 74* (US, FH). Minnesota. Otter Tail Co.: Maplewood State Park, *Esslinger 5139* (herb. Esslinger). New Mexico. Colfax Co.: vicinity of Ute Park, *Standley 13508* (FH). North Dakota. Ransom Co.: ca. 4 mi. WSW of McLeod, *Esslinger 4916* (herb. Esslinger); Richland Co.: ca. 18.5 mi. N of Wyndmere, *Esslinger 4881* (herb. Esslinger). Ohio. Cuyahoga Co.: Cleveland, *Lea*, 1850 (FH). Oklahoma. Bryon Co.: 1.5 mi. N of Lake West, *Keck 1473* (US); Noble Co.: 10 mi. SE of Perry, *Adams 28* (US). Tennessee. Rutherford Co.: NE of Rockvale, *Pursell 3461* (US). Texas, no locality, *Wright*, 1850 (FH). Vermont. Addison Co.: Bristol, *Riddle*, 1908 (FH). Virginia. Giles Co.: below Mountain Lake, *Culberson 11286* (DUKE). Wisconsin. Douglas Co.: 11.5 mi. N of Dairyland, *Schroeder & Schroeder L459* (herb. Esslinger). Canada. Ontario: London, *A.T.D. 41* (FH).

*PHAEOPHYSCIA HISPIDULA* (Ach.) Essl., comb. nov.
Basionym: *Parmelia hispidula* Ach., Lichenographia Universalis: 468. 1810.

The variability of this taxon is still under study. There appear to be at least two distinct species involved here but the nomenclature is unsettled. It is uncertain to which of the two species the name *Ph. hispidula* will accurately be applied. For the time being, only one species will be recognized, as has been the practice in the past.

The members of this complex are distinguished from the *Ph. orbicularis* group largely on the basis of size. *Phaeophyscia hispidula* (sensu lato) has moderately large thalli (up to 14 cm in diameter, commonly 4-8 cm) with lobes from 1 to 4 (rarely to 6) mm broad. Other North American *Phaeophysciae* generally have smaller thalli (usually 5 cm or less in diameter, very rarely up to 10 cm) and lobes averaging less than 2 mm broad (generally ca. 1 mm or less, rarely up to 3 mm). Thalli of *Ph. hispidula* are seldom regularly rosette forming as are many (but not all!) other *Phaeophysciae*, and the irregularly branched lobes have a very distinctive appearance. Almost without exception they are somewhat concave, especially at the lobe ends (due to upturned tips), and specimens with elongate lobes may be decidedly channeled. The rhizines are mostly simple as in other *Phaeophysciae* but are generally longer and more dense than in most other species. The long black rhizines (always with some that exceed 1 mm in length, with 2-3 mm being common and up to 5 mm long not rare) are often conspicuous from above, especially at the lobe ends where they project outward and often (a few) upward. The longer rhizines are sometimes distinctly flexuose. Apothecia are rare north of Mexico; ascospores are of the *Physcia*-type [20-25 (-27) x 10-14 µm].

Poelt (1974) recognized four taxa in this complex, all at the level of subspecies, and delimited approximately as follows:

-without isidia or soredia: *Physcia hispidula* ssp. *primaria* Poelt
-with marginal granular soredia: *Physcia hispidula* ssp. *limbata* Poelt
-with marginal isidia: *Physcia hispidula* ssp. *exornatula* (Zahlbr.) Poelt.
-with submarginal capitate soralia: *Physcia hispidula* ssp. *hispidula*

As far as I can determine from his paper, Poelt did not examine the types of any of the previously described taxa involved and therefore did not settle the correct application of the name *Physcia hispidula* [or its supposed synonym *Physcia setosa* (Ach.) Nyl.].

The two taxa (seemingly good species) I recognize in this group correspond approximately to Poelt's ssp. *hispidula* and ssp. *limbata*. I believe that ssp. *primaria* and ssp. *exornatula* are only extremes of ssp. *limbata* (extremely sparsely sorediate in the first case and with extremely strongly isidioid soredia in the second case). In the United states, the taxon with marginal, granular or isidioid soredia (ssp. *limbata*) has a distinctly western distribution (see specimen citations below) and is primarily saxicolous (ca. 25 of 31 specimens). Contrastingly, the taxon with capitate soralia and more finely granular soredia tends to be eastern (see specimens cited below) and primarily corticolous (14 of 15 specimens). Both occur in Mexico and Central America. A similar trend regarding substrates can be seen between the two taxa outside of North America as well, although seemingly not so pronounced.

In North America, the species most likely to be conused with *Ph. hispidula* (sensu lato) are related *Ph. imbricata* and *Ph. kairamoi*. Both have generally smaller thallus dimensions, although they can overlap broadly in size with *Ph. hispidula*. *Phaeophyscia imbricata* differs by possession of numerous, usually erect lobules along the lobe margins. These lobules, at their small extreme, may be somewhat granular, resembling isidioid soredia of *Ph. hispidula*, but thalli with such small granular lobules generally also have larger, more distinctive lobules in some parts. *Phaeophyscia kairamoi* has strongly isidioid soredia not unlike those of *Ph. hispidula* (ssp. *limbata*) but they bear (as also do some lobe tips) small, pale or darkening cortical hairs. The strongly isidioid soredia of *Ph. hispidula* sometimes bear sparse, small black rhizines. The occasional smaller-than-average specimens of *Ph. hispidula* might be mistaken for a number of the other sorediate *Phaeophysciae* and must be distinguished by the irregular thallus, concave (upturned at tip) lobes and the outward and upward spreading rhizines.

Chemistry: All spot tests negative. No substances detected by TLC.

Representative specimens (ssp. *limbata*): Arizona. Cochise Co.: Chiricahua Mtns., Cave Creek Canyon, *Lich. Exs. Colo. No. 93* (US, DUKE); Pima Co.: Mt. Lemmon, *Culberson & Culberson 10565* (DUKE). Colorado. Jefferson Co.: Bull Gulch, between Plainview & Eldorado, *Weber & Anderson*, L36337 (US, DUKE, FH); Boulder Co.: Boulder Canyon just above Boulder Falls, *Weber & Shushan*, S2170 (FH). New Mexico. Rio Arriba Co.: vicinity of Brazos Canyon, *Standley & Bollman 11140* (US, FH); Santa Fe Co.: Santa Fe, *Reliquiae Tuckermanianae 71* (US, DUKE). South Dakota. Pennington Co.: 10 mi. NW of Rapid City, *Wetmore 8790* (DUKE), 13 mi. SW of Rapid City, *Anderson*, S20932 (US). Texas. Brewster Co.: Big Bend National Park, Casa Grande, *Wetmore 19518* (FH). Mexico. Chihuahua: San Pedro Springs, *Gooding*, 1907 (FH); Federal District: Cañada, *Pringle 15563* (FH); Michoacan: Patzcuaro, *Pringle 123* (FH), *257* (FH, DUKE); Sinaloa: in mtns. 109 km (by road) E of Mazatlán, *Culberson 13437, 13409* (DUKE); Veracruz: Teocello Canyon, just S of Xico & Jalapa, *Hale 21071* (DUKE); Puebla: Santa Barbara, *Nicolas 5755* (US).

Representative specimens (ssp. *hispidula*): Maine. Knox Co.: Warren, *Merrill, Lich. Exs. No. 65* (US, FH, DUKE). Michigan. Baraga Co.: Slate River Falls, *Imshaug 4679* (FH, US); Emmet Co.: Wilderness Park, *Hale 11245* (US). Minnesota. Koochiching Co.: Big Falls, *Hale 22273* (US); St. Louis Co.: near E end of Kabetogama Lake, *Williams*, 1977 (herb. Esslinger). New York. Essex Co.: Jay, *Riddle*, 1908 (FH). Ohio, no locality, *Lesquereax 246* (FH). Virinia. Lee Co.: E of Jonesville, *Hale 33334* (US). West Virginia. Greenbrier Co.: Neola, *Hale 18958* (US). Canada. Ontario: Ottawa, *Macoun 17* (FH), *96* (US). Mexico. Federal District: La Cima, *Pringle 10737* (DUKE, FH). Costa Rica. San Jose: between Empalma & Santa Maria, *Culberson 12446* (DUKE). Panama. Chiriqui: 1 km N of Las Nubes, *Almeda 998* (herb. Esslinger). Jamaica. Portland: ca. 1 mi. from Section, *Culberson & Culberson 13875* (DUKE).

*PHAEOPHYSCIA IMBRICATA* (Vain.) Essl., comb. nov.
Basionym: *Physcia imbricata* Vain., Bot. Mag. Tokyo 35: 60. 1921.

This species has previously been known in the North American literature as *Physcia lacinulata* Müll. Arg. The latter species is superficially very similar to *Ph. imbricata* but differs markedly in having atranorin in both the cortex and the medulla which are therefore strongly K+ yellow. In addition *Ph. lacinulata* differs in having a much paler (almost white) upper surface, a very pale tan lower surface with sparse rhizines, and ascospores of the *Pachysporaria*-type [20-24.5 x 9-11 µm] (Fig. 9). The North American (and Japanese) species, *Ph. imbricata*, lacks atranorin (K- cortex and medulla), has a dull gray to pale brownish (especially on lobe margins) upper surface, often with a light necrotic pruina, a lower surface that is typically dark brown to black except on lobe ends or margins (occasionally darkening only in smaller areas) and has numerous black rhizines, and ascospores of the *Physcia*-type [(18-)20-24(-27) x 9-11.5(-13.5) µm] (Figs. 5 & 6).

*Phaeophyscia imbricata* is a very distinctive species, being the only member of the genus with a regularly lobulate thallus and a white medulla. The lobules are primarily marginal and generally tend to be more or less erect. There is considerable variation in size among the lobules, which measure (50-)80-250(-500) µm in breadth and typically are longer than they are broad; they may be simple or branched. Some lobules at the low end of the size range resemble isidia and at their extreme may appear almost granular. Some obviously dorsiventral lobules are always present, however. Specimens with the larger lobules at times appear almost panniform. The lobules are obvious propagules and apothecia are infrequent (observed in 4 of 25 North American specimens and 2 of 6 Japanese specimens). Based on herbarium specimens annotated by J. W. Thomson, his *Physcia ciliata* f. *squamulosa* Thoms. is a synonym of *Ph. imbricata*, but I have not seen the type. The occasional weakly lobulate specimens of *Ph. ciliata* that are seen can be easily distinguished from *Ph. imbricata* by their lack of zeorin.

Thomson (1963) and Hale (1969) characterized this species (as *Physcia lacinulata*) as having a white lower surface. Although the type of *Ph. lacinulata* (see below) is distinctly white or pale tan on the lower surface, true *Ph. imbricata* is dark brown to black on most of the lower surface. A significant area on the lobe tips and margins may be very pale and rarely (only 2 of about 30 specimens examined) larger areas may be relatively pale. There are almost always some darkened areas, however, and the rather numerous black rhizines are characteristic of species that ususally have darkened lower surfaces. *Phaeophyscia imbricata* occurs most commonly on tree bases or over mosses on rock. In North America, it has a distinctly eastern distribution (Fig. 15).

The protologue of *Physcia lacinulata* Müll. Arg. (Soc. Royal de Bot. Belgique 30: 54. 1891) cites three syntypes. One of these (*Pittier 5065)* is not the same as the other two and in fact is a sorediate (not lobulate at all) specimen corresponding to "*Physcia albicans* (Pers.) Thoms." (=*Ph. crispa* Nyl.). The other two specimens are the same lobulate species and I have selected the more abundant one of these as lectotype [Costa Rica, Foret du Barba, *Pittier 5064* (G)]. The lower cortex of *Physcia lacinulata*, although pale, is paraplectenchymatous, a feature that would seem to relate it most closely to members of the *Physcia tribacia-tribacioides* group. Like some other members of that group, some lumina in the lower cortex seem to be weakly periclinally elongate, possibly indicating an obscure prosoplectenchyma rather than a true paraplectenchyma.

Chemistry: All spot tests negative. Zeorin and often traces of other unidentified terpenoids by TLC.

No specimens will be cited; see the distribution map (Fig. 15).

*PHAEOPHYSCIA KAIRAMOI* (Vain.) Moberg, 1977: 40.

Basionym: *Physcia kairamoi* Vain., Medd. Soc. F. Fl. Fenn. 46: 3. 1921.

Synonyms: *Physcia karakorina* Poelt, Mitt. Bot. Staatssamml. München 4: 92. 1961. Type: not seen. *Physcia nadvornikii* Frey et Poelt, Ber. Schweiz. Bot. Ges. 73: 472. 1963 (as nom. nov. for *Ph. cernohorskyi* var. *erosa* Nádv., Studia Bot. Čech. 8: 99. 1947). Type: Austria. Tirol: am wege gegen dos Sellajoch bei Wolkenstein in Groeden, in *Arnold, Lich. Exs. No. 1649* (DUKE, isotype).

This species was first reported for North America by Moberg (1974). The synonymy seems to be largely a result of the broad distribution coupled with a low frequency of occurrence. *Phaeophyscia kairamoi* is a fairly distinctive species although it has seldom been recognized in the past. The diagnostic features are the dark marginal isidia which bear sparse, pale (or darkening) cortical hairs. Similar hairs are present on some lobe tips and, in some specimens, also on the apothecial margins. In older specimens some of the isidia become weakly lobulate and the pale hairs blacken, resembling short rhizines. Regarding size, North American specimens are average *Phaeophysciae* (thalli to 5 or 6 cm, lobes mostly 0.5-2 mm), although Moberg (1969) reported thalli up to 15 cm and lobes 1-4 mm broad for Scandinavian specimens. The irregular thalli with irregularly branched lobes and the upturned densely rhizinate lobes resemble *Ph. hispidula*; the larger specimens of *Ph. kairamoi* might be mistaken for that species. Apothecia are rather frequent for an isidiate species (absent in only one of the 10 North American specimens examined), the apothecia being up to 3 mm broad with the upper exciple naked or bearing sparse hairs. The ascospores are rather large [(22.5-)24-32(-34) x (8-)10-14 µm] and are distinctly *Physcia*-type although the lumina of some become more or less rounded with age.

Most specimens are from rock or soil or from mosses over rock. One specimen (*Esslinger 5394* from Minnesota) was collected from the base of a tree (*Thuja*) on a rocky slope and two Austrian specimens (cited below) from twigs were seen. In addition to the localities cited below and those North American localities plotted on the distribution map (Fig. 15), this species has previously been reported from Norway, Finland, Sweden, U.S.S.R., Austria, Italy, Kashmir, and Canada (Moberg, 1969, 1974).

Chemistry: All spot tests negative. No substances detected by TLC.

Representative specimens (see Fig. 15 for North American localities): Austria. Salzburg: Krimml, *Klement*, 1952 (DUKE); Tirol: am Stuibenfall bei Umhausen im Ötztal, *Lich. Alpium No. 173* (DUKE). U.S.S.R. Guv. Jenisejsk: Tjolkina, Jenisejsk, *Brenner 133d* (FH), Tschulkova, *Brenner 2584* (FH).

*PHAEOPHYSCIA LEANA* (Tuck.) Essl., comb. nov.

Basionym: *Parmelia leana* Tuck. in Lea, Cat. Plants Cincinnati: 45. 1849. Type: Ohio, *Lea*, 1848 (FH, holotype).

*Phaeophyscia leana* is characterized by the rather elongate, strap-shaped lobes, faintly maculate upper surface, lack of soredia, and the paraplectenchymatous, pale lower cortex. For years it has been known in North America only from the type collection, made from the trunk of a tree near Cincinnati, Ohio. The species has now also reportedly been collected in southern Illinois by Dr. A. Skorepa (in litt.).

Kashiwadani recently (1975) reported this species from Japan. The five Japanese specimens seen by me, however, differ from North American *Ph. leana* in several ways. First and most significantly, the five Japanese specimens all have relatively thick-walled spores of the *Pachysporaria*-type (Fig. 10) while those of *Ph. leana* are distinctly of the *Physcia*-type (Fig. 7). Spore size is virtually identical, 18-23 x 8-10.5 µm. In addition the type specimen of *Ph. leana* differs from the Japanese specimens by the following characters: it has longer, more distinctly strap-shaped lobes; the upper surface is lightly but distinctly maculate throughout; apothecia are short stipitate instead of sessile; excipular rhizines are very few rather than numerous, and the exciple is entire to weakly crenate but lacks the tiny, often downward pointed lobules seen on many of the Japanese specimens. Although the relative numbers of excipular rhizines vary greatly in most species of *Phaeophyscia*, the other characters outlined above indicate that the Japanese specimens represent a species distinct from (although similar to) *Ph. leana*. The appropriate name for the Japanese species would be *Phaeophyscia trichophora* (Hue) Essl., comb. nov. Basionym: *Physcia trichophora* Hue, Nouv. Arch. Mus. Hist. Nat. Paris, ser. 4, 2: 74. 1900.

Chemistry: All spot tests negative. No substances detected by TLC.

*PHAEOPHYSCIA NIGRICANS* (Flk.) Moberg, 1977: 42.

Basionym: *Lecanora nigricans* Flk., Deutsche Lichenen 91. 1819. Not seen.

*Phaeophyscia nigricans* is probably more common and widespread in North America than the specimens cited below would indicate. The small thalli (up to 1 or 2 cm but sometimes coalescing), narrow lobes (0.05-0.3 mm broad), and gray-brown coloration combine to make this specis almost invisible on the usual substrate (*Populus* or other angioserm bark, rarely rock). Specimens tend to be more or less rosette forming with lobes appressed or sometimes ascending at the ends. Granular, darkened isidia are generally present, borne on lobe tips or margins. The upper and lower cortices are paraplectenchymatous as in other *Phaeophysciae*, but the medulla of some specimens is partly hyphal and partly cellular, sometimes with normal paraplectenchyma and other times with swollen-celled moniliform hyphae. Apothecia are infrequent and small, with distinctive *Physcia*-type spores 16.5-20 x 7-10 µm.

Chemistry: All spot tests negative. No substances detected by TLC.

Specimens examined: Colorado. Boulder Co.: just S of Red Hill, between Altona and Lyons, *Shushan & Weber*, S3385 (FH). North Dakota. Dunn Co.: ca. 5.5 mi. N and 11.5 mi. W of Killdeer, *Esslinger 5759* (herb. Esslinger, US). Wyoming. Crook Co.: Lytle Creek E of Devils Tower National Monument, *Wetmore 11494* (DUKE).

*PHAEOPHYSCIA ORBICULARIS* (Neck.) Moberg, 1977: 44.

Basionym: *Lichen orbicularis* Neck., Delicae Gallo-Belgicae: 509. 1768.

The taxonomy and distribution of this species in North America were discussed by Esslinger (1977). The name *Ph. orbicularis* has been used in a very broad sense for many years to include such species as *Ph. adiastola*, *Ph. rubropulchra*, and *Ph. pusilloides*, among others. *Phaeophyscia orbicularis* is characterized by its laminal and submarginal, punctiform to irregular soralia and relatively fine granular soredia. The lower surface is almost always black but rarely is largely pale, darkening only in the older parts. Such specimens would have to be carefully distinguished from *Physcia melanchra* (q.v.) which also has a pale (but prosoplectenchymatous) lower cortex and laminal soralia. The ascospores of *Ph. orbicularis* are *Physcia*-type [(17-)

20-25(-28) x 8-11 µm].

Chemistry: All spot tests negative. No substances detected by TLC or, rarely, a slight trace of zeorin will be present; an unknown anthraquinone is occasionally present in the soralia, see Esslinger, 1977.

No specimens will be cited; see the distribution map in Esslinger (1977).

*PHAEOPHYSCIA PUSILLOIDES* (Zahlbr.) Essl., comb. nov.

Basionym: *Physcia pusilloides* Zahlbr., Cat. Lich. Univ. 7: 678. 1931 (as nom. nov. for *Ph. pusilla* Meresch., Ann. Conserv. Jard. Bot. Genève 21: 188. 1919). Type: Switzerland. Lugano, *Mereschkowsky*, 1919 (FH, syntype).

Although this taxon has been recognized in Europe by several authors (Mereschkowsky, 1919; Nádvornik, 1947; Frey, 1963), it was only recently reported for North America by Poelt (1971). The distinguishing characters are the distinctly globose (capitate) soralia (formed by the strongly reflexed lobe tip) found on the lobe ends or margins or on small lateral lobes, the dark rhizines which often project from the margin and are visible from above, and the narrow, more or less linear lobes. The soralia-bearing lobes are often more or less ascendent, giving the soralia a stipitate appearance. Occasionally the rhizines are not or only slightly visible from above. Even more rarely the lower surface of the lobe ends and the associated rhizines are pale (almost white), but they are always blackish inward. Young or incompletely developed soralia are often weakly to distinctly labriform. Occasionally the soredia of *Ph. pusilloides* become enlarged and granular isidioid [e.g., *Culberson 6388* (DUKE)] but are still distinctly clustered into capitate soralia. Apothecia are uncommon, the spores are of the *Physcia*-type [18-23(-25) x 7-10.5 µm] although the lumina of some round off with age. *Phaeophyscia pusilloides* is largely corticolous and has an eastern distribution in North America (Fig. 18).

Chemistry: All spot tests negative. No substances detected by TLC [A few specimens were seen in which the soralia and the medulla near the soralia contained a pale yellow pigment (K+ violet), probably an anthraquinone; it was present in amounts too small for TLC analysis].

No further specimens will be cited; see the distribution map (Fig. 18).

*PHAEOPHYSCIA RUBROPULCHRA* (Degel.) Essl., comb. nov.

Basionym: *Physcia orbicularis* f. *rubropulchra* Degel.,

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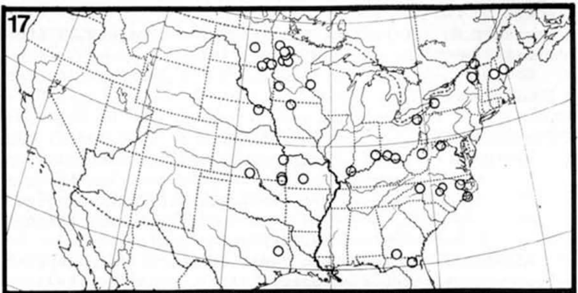

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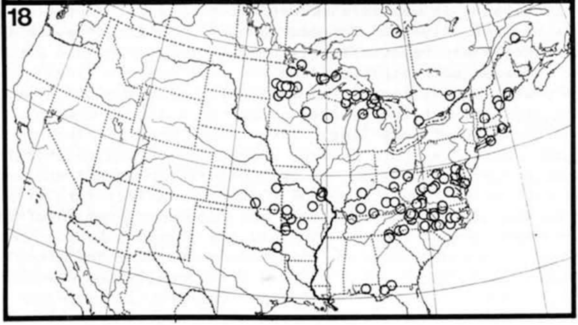

Figure 17. North American distribution of *Physcia luganensis*.
Figure 18. North American distribution of *Phaeophyscia pusilloides*.

Ark. Bot. 30A(1): 58. 1940.

Because of the red medulla this is one of the more easily recognized sorediate species of *Phaeophyscia* in North America. Although the concentration of skyrin in the medulla varies somewhat (and may be absent near the lobe tips), it can always be seen in the older thallus parts. Morphologically, this species most closely resembles *Ph. adiastola* which, however, lacks the skyrin and fatty acid characteristic of *Ph. rubropulchra*. Also, the ascospores of

*Ph. rubropulchra* are larger [(21-)24-31(-34) x (9-)10-14 (-16) µm] than those of *Ph. adiastola* (q.v.) and are of the *Pachysporaria*-type rather than the *Physcia*-type. *Phaeophyscia rubropulchra* is largely corticolous while *Ph. adiastola* is more frequent on mosses over rock (see Esslinger, 1977).

Chemistry: Medulla K+ purple. Skyrin and an unidentified fatty acid ($R_f$ classes A:2-3, B:1, C:1-2).

No specimens will be cited; see the distribution map in Esslinger (1977).

PHAEOPHYSCIA SCIASTRA (Ach.) Moberg, 1977: 47.

Basionym: *Parmelia sciastra* Ach., Methodus Lichenum (Supplement): 49. 1803.

*Phaeophyscia sciastra* can be distinguished by the dark, mostly marginal or submarginal isidia, the narrow lobes (mostly 0.15 to 0.5 mm broad) and the saxicolous habitat (also on mosses or soil over rock). Another isidiate species of similar habitat, *Ph. kairamoi* can be distinguished by the generally broader lobes (mostly 0.5-2 mm) and by the cortical hairs produced on the isidia (sometimes more like granular isidioid soredia) and on some lobe tips. The isidia of *Ph. sciastra* may become numerous, virtually covering central parts of the thallus, or they may be very sparse, in which case such specimens are sometimes misidentified as *Ph. decolor*. A careful search for isidia will usually distinguish the two, otherwise *Ph. decolor* can be separated from *Ph. sciastra* by its production of zeorin. The ascospores of *Ph. sciastra* are of the *Physcia*-type [16-20.5 x 7-10 µm], but apothecia are rare in North America.

The asexual propagules of this species are the most isidia-like of any of the species of *Phaeophyscia*. The tendency for these structures to occur in marginal or occasionally laminal clumps and to have a cortex different in appearance (darker and apparently thinner) from that on the upper surface of the lobes, may nevertheless indicate their basic nature as granular, strongly isidioid soredia. They vary in size, being (40-)50-120(-160) µm in diameter, mostly somewhat irregular but sometimes more or less cylindrical. The isidia of *Ph. kairamoi* are similar in appearance but, on occasion, even more soredia-like. The soredia of the many sorediate species of *Phaeophyscia* may at times also become pseudocorticate and thus isidioid, but this may be under the control of environmental factors.

Chemistry: All spot tests negative. No substances detected by TLC.

Representative Specimens: Idaho. Blaine Co.: Wood

River Campground, Sawtooth Rec. Area, *Hale 50092* (US); Boundary Co.: Copper Falls, Kaniksu Nat. Forest, *Hale 48224* (US). Michigan. Keweenaw Co.: Isle Royale National Park, *Wetmore 239* (DUKE). Minnesota. Cook Co.: Suzie Islands, *Thomson 3948* (DUKE). Montana. Gallatin Co.: Spanish Peaks Primitive Area, *Hale 49225* (US); Lincoln Co.: Kootenai Falls 6 mi. E of Troy, *Hale 48159, 48175, 48176* (US); Madison Co.: Bear Trap Canyon Primitive Area, *Hale 48132* (US); Missoula Co.: Holland Lake Campground, *Hale 48574* (US). North Dakota. Slope Co.: ca. 6.5 mi. N and 9 mi. W of Amidon, *Williams L174* (herb. Esslinger). South Dakota. Pennington Co.: just N of Hill City, *Hale 49998* (US). Washington. Pend Oreille Co.: N end of Sullivan Lake, *Esslinger 6047* (herb. Esslinger); Spokane Co.: foothills N of Millwood, *Esslinger 4796* (herb. Esslinger). Canada. Alberta: Banff National Park, Valley of Ten Peaks, *Hale 49533* (US); Ontario: Lake Nipigon, *Macoun*, 1884 (FH).

*PHYSCIA LUGANENSIS* Meresch., Ann. Conserv. Jard. Bot. Genève 21: 190. 1919. Type: Switzerland. Lugano, *Mereschkowsky*, 1919 (US, FH, syntypes).

Although long confused with *Phaeophyscia orbicularis* and other members of that genus, this is one of the more distinctive species included here. The pale lower surface and presence of terminal labriform soralia will separate this species from virtually all other K- Physciaceae. Occasional specimens of *Phaeophyscia hirsuta* have a pale lower surface (darkening only slightly and only in the older parts) and if the cortical hairs are overlooked or poorly developed, that species may be mistaken for *Ph. luganensis*. The latter species has a distinctly eastern distribution (Fig. 17) while the few known North American specimens of *Ph. hirsuta* are western. The two do overlap in the midwest, however, and questionable specimens from that area may require sectioning for examination of the lower cortex (prosoplectenchymatous in *Ph. luganensis* and paraplectenchymatous in *Ph. hirsuta*). *Physcia luganensis* was recently reported for North America by Esslinger (1973). Further discussion and description are provided there. This species is closely related to *Ph. melanchra* (q.v.).

The ascospores of *Ph. luganensis* and the following two related species are variable and somewhat less distinctly defined as to type than most of the *Phaeophysciae*. Basically, they are of the *Physcia*-type, but in many specimens the lumina of more mature spores become irregular or rounded rather than angular. The lumina may also become more elongate than usual. However, the thin side walls characteristic of *Physcia*-type spores are generally still obvious. The ascospores of *Ph. luganensis* are 17-22 x 8-10.5 µm.

Chemistry: All spot tests negative. No substances detected by TLC.

No specimens will be cited; see the distribution map (Fig. 17).

*PHYSCIA MELANCHRA* Hue, Nouv. Arch. Mus. Hist. Nat. Paris, ser. 4, 2: 75. 1900.

This species was known previously only from Japan (Kashiwadani, 1975). Although not as widespread or common in North America as closely related *Ph. luganensis*, at least locally (e.g. in some of the North Dakota localities), it is one of the more common species of macrolichens. The pale lower surface with prosoplectenchymatous cortex and the laminal to submargianl, punctiform or irregular soralia, will distinguish this species from all others. *Physcia luganensis* has mostly labriform soralia although some laminal soralia may also be present. The two species occasionally grow intermixed and must than be carefully distinguished. In western North Dakota this species was found growing intermixed with very similar appearing forms of *Phaeophyscia orbicularis*. When only the upper surface is viewed, the two species can look remarkably the same and in fact some mixtures could be sorted only by examination of the lower surface (dark to black in *Ph. orbicularis*). When fertile, the apothecia of *Ph. melanchra* lack the corona of rhizines at the base that is characteristic of *Ph. orbicularis* apothecia. The apothecia of *Ph. melanchra* are fairly common and tend to be slightly stipitate. Ascospores are *Physcia*-type [(14-)17-22 x (6-)7-10 µm] although lumina of some tend to become elongate and rounded as in *Ph. luganensis*. *Physcia melanchra* occurs equally commonly on bark and on rock.

Chemistry: All spot tests negative. No substances detected by TLC.

Representative specimens: Colorado. Yuma Co.: 6 mi. E of Wray, *Shushan & Anderson*, L32962 (DUKE). Massachusetts. Hampshire Co.: Amherst, *Tuckerman*, 1861 (FH); Franklin Co.: near Whately, *Esslinger 4044* (herb. Esslinger). Minnesota. Yellow Medicine Co.: 6 mi. SE of Montevideo, *Hale 23346* (US). North Dakota. Burleigh Co.: 13 mi. SW of Bismarck, *Esslinger 5590* (herb. Esslinger); La Moure Co.: Kulm, Wirch Lake, *Brenckle 1104* (FH, NDA); Dunn Co.: ca. 5.5 mi. N & 11.5 mi. W of Killdeer, *Esslinger 5762* (herb. Esslinger); Eddy Co.: vic. New Rockford, *Esslinger 5066* (herb. Esslinger); Slope Co.: ca. 7 mi. N and 5 mi. W of Amidon, *Esslinger 5665* (herb. Esslinger). Vermont. Chittenden Co.: Burlington, *Russell 322* (FH). Canada. Ontario: London, *Drummond*, 1865 (FH).

*PHYSCIA NEPALENSIS* Poelt, Khumbu Himal 6: 83. 1974.
Type: Nepal. Katmandu-Jawalakhel, 1400 m, *Poelt L1457* (M, holotype).

Two somewhat scrappy collections from the Southwest have been tentatively identified with this species. They agree with the type specimens of *Ph. nepalensis* in all particulars. In general appearance the specimens appear similar to *Physcia stellaris* (L.) Nyl., since the lower cortex is pale and prosoplectenchymatous. The upper cortex, however, lacks atranorin (K-) and is a dingier gray-white color than is typical for *Ph. stellaris*. If the K- upper cortex is noticed early in identification and the pale lower surface is overlooked, *Ph. nepalensis* may be identified as *Phaeophyscia ciliata* which has a dark or black, paraplectenchymatous lower cortex.

Altough originally described by Poelt (1974) as having *Pachysporaria*-type spores, the spores of both the type specimen (Fig. 8) and the only fertile North American specimen are of the *Physcia*-type; the lumina, however, vary from angular to oval or almost round. Their range in size is virtually identical [ca. 17-23.5 x 7-9 µm]. A somewhat similar Japanese species, *Physcia denigrata* Hue, has larger [ca. 24-29 x 10-11.5 µm], definitely *Pachysporaria*-type spores (Fig. 11 & 13) and generally larger thallus dimensions.

Chemistry: All spot tests negative. No substances detected by TLC.

Specimens examined: New Mexico. Santa Fe Co.: Santa Fe Canyon, on bark, *Arsène 20520* (FH). Texas. El Paso Co.: Fort Bliss, on *Ephedra & Cercocarpus*, *Clemens 11367* (FH).

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MYCOTAXON

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# Scirrhia filicina comb. nov. (Ascomycetes: Dothideales)

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Owing to the poor condition of many of the distributed isotypes of the species, and the ambiguity of Niessl's (Schroeter, 1874) brief original description, the correct application of the name *Stictis filicina* Niessl has long been in doubt. Rehm (1887-96) transferred the species to *Xylogramma* on the strength of Niessl's description, but found no asci or spores in the specimens he examined. In a survey of the genus *Stictis* (Sherwood, 1977) I examined two isotypes of the species (FH-Rabenhorst, Fungi Europaei 1709), finding them overmature and uncharacterizable.

Among specimens of *Stictis* sent to me by Josef Poelt (GRZ) for revision was another example of Fungi Europaei 1709 containing abundant fruiting material of a fungus corresponding to Niessl's description. The species is clearly neither a *Stictis* Pers. nor a *Xylogramma* Wallr., but rather a stromatic Loculoascomycete referrable to *Scirrhia* Fckl. s.l. in the Dothideales. According to Margaret Bigelow (*personal communication*), *Scirrhia* s.l. contains discordant elements, including aparaphysate species belonging to the Dothideales s. str., and pseudoparaphysate species belonging to the Pleosporales. The present species belongs to the Pleosporalean component, allied to *S. aspidiorum* (Lib.) Bubák. *Scirrhia filicina* differs from this and other species in the genus in having a reduced, almost colorless stroma. Obrist (1959) recognized a separate genus, *Scirrophragma* Theiss. & Sydow, for another species with light-colored stromata, *S. osmundae* (Peck & Curt.) Obrist; the two genera are united by Müller and von Arx (1962). *Scirrhia filicina* differs from *S. osmundae* (Peck & Curt.) Arx in having consistently 1-septate spores.

*Scirrhia filicina* is briefly redescribed below.

Scirrhia filicina (Niessl) Sherwood, comb. nov. (Figure 1)
≡ *Stictis filicina* Niessl, Bot. Jahresber. (Just) 2: 284 (1874)
≡ *Xylogramma filicina* (Niessl) Rehm *in* Rabenhorst, Kryptogamenfl. ed. 2, 1(3): 171 (1888)

Stromata subepidermal, almost colorless, inconspicuous, 0.5-1.0 x 0.2 mm, linear, becoming exposed by splitting the overlying substrate lengthwise. Stroma in cross section ca. 150 µm thick, of vertically-oriented, thin-walled pseudoparenchyma, the cells ca. 10 x 5 µm, colorless below, pale brown above. Pseudothecia arranged in a single line in the center of the stroma, spherical, lacking a prominent beak,

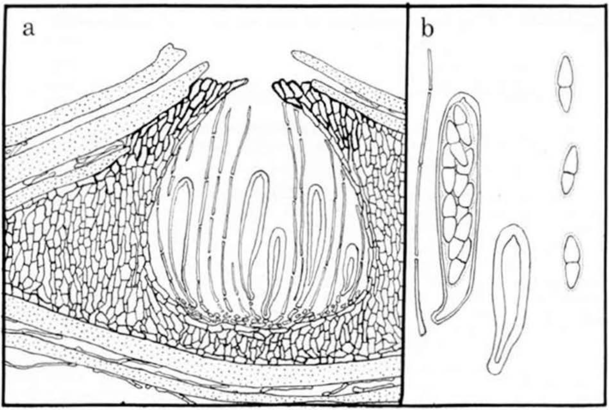

Figure 1. *Scirrhia filicina*. a. Cross section of stroma and pseudothecium, x375. b. Asci, pseudoparaphysis, and spores, x750. Stippled areas are host tissue. Drawn from GRZ-Rabenhorst, F. Eur. 1709.

ca. 100 μm diam. Asci 48-60 x 9-12.5 μm, bitunicate, 8-spored, accompanied by pseudoparaphyses. Ascospores 12-15 x 3.5-5.0 μm, 1-septate, constricted at the septum, narrowly sheathed. On dead stems of *Pteridium aquilinum*, Europe.

SPECIMEN EXAMINED: EUROPE: Austria (GRZ, Herb. J. Poelt 6864, Rabenh., F. Eur. 1709, auf *Pteridium aquilinum*, Voitsberg, Steiermark, leg. Niessl, isotype of *Stictis filicina*).

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# FILOSPORELLA, AN EARLIER NAME FOR COELOANGUILLOSPORA

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## SUMMARY

Coeloanguillospora Dyko & Sutton is placed into synonomy with Filosporella Nawawi, and comparison is made between F. aquatica Nawawi and F. annelidica (Shearer & Crane) Crane & Shearer. A full synonymy is given for the latter taxon.

Scolecosporous hyphomycetes with holoblastic conidial ontogeny are common in aquatic habitats; among the best known is Anguillospora longissima (Sacc. & Syd.) Ingold. Critical study has revealed other taxa with similar characteristics (Dyko & Sutton, 1978; Iqbal, 1971, 1972, 1974 a, b; Nawawi, 1976; Petersen, 1962, 1963; Ranzoni, 1952; Shearer & Crane, 1976; Wolfe, 1976). Genera represented in this group are Anguillospora Ingold, Coeloanguillospora Dyko & Sutton, Filosporella Nawawi, Mycocentrospora Deighton, Pseudoanguillospora Iqbal, Rogersia Shearer & Crane, and Sigmoidea Crane. While Sigmoidea proliferata (R. H. Pet.) Crane was originally described as phialidic, its conidial ontogeny is holoblastic with a sympodially proliferating conidiogenous cell and it should be considered in this group (Dyko, 1977).

With the great amount of study that aquatic and water-borne hyphomycetes are receiving at this time, it is not surprising that redundant introductions of taxa should occur. In addition, the specialized conidiomata which characterize the Melanconiales and the Tuberculariales intergrade and sometimes are reduced to separate discrete conidiophores in culture thus leaving no clear separation between these two groups and the Moniliales (Mason, 1937; Sutton, 1973). Coeloanguillospora appalachiensis Dyko & Sutton (1978) was first described from cultures obtained from submerged decaying leaves. Scolecosporous conidia were produced holoblastically in cupulate fruiting structures. It was found later that upon submergence, conidia were produced on loosely-arranged branched conidiophores typical of *Filosporella* Nawawi. While annellides seemed to occur infrequently in our isolate, and no previous description of any *Filosporella* species mentioned cupulate fruiting structures in culture, comparison with the type of *F. annelidica* (Shearer & Crane) Crane & Shearer showed the two fungi to be conspecific. Additionally, after study of our isolate and comparison with published descriptions of *Anguillospora pulchella* Wolfe and *A. virginiana* Wolfe (Wolfe, 1971, 1976) it appeared certain that these two fungi were also later synonyms of *F. annelidica*. Wolfe (1971) was the first to recognize this taxon as being distinct from *A. longissima*. His name, *A. pulchellus*, would normally provide the earliest specific epithet but description in a doctoral dissertation is not recognized as effective publication by the International Code of Botanical Nomenclature (Art. 29). The name was validly published later by Wolfe (7 March, 1977) and Dyko (1977) concluded that *A. virginiana*, which was described simultaneously with *A. pulchellus*, was merely a growth form of the same fungus. Regrettably the holotypes of both *A. pulchellus* and *A. virginiana*, although reported as at VPI (Wolfe, 1977), could not be located there. Authentic material could not be obtained from the author.

*Rogersia annelidica* Shearer & Crane (13 October, 1976), type species of the genus, was soon found to be identical with *Filosporella aquatica* Nawawi (18 September, 1976), the type species of that genus. The two genera, therefore, were placed in synonymy (Crane & Shearer, 1977). Conversely, we find the two to be quite distinct.

The conidia of *F. aquatica* tend to be clavate with quite blunt apices during development, and by maturity the apices gradually taper to a point: the mature conidia are usually straight or slightly curved. The conidiogenous cells give the appearance of percurrently proliferating but annellations are a considerable distance apart (9-20µ) and no frill of wall material can be discerned between the proliferations either with bright field or interference contrast (Nomarski) phase optics. These percurrent proliferations are septate and constricted between each unit thus giving a beaded appearance to old conidiogenous structures.

The conidia of *F. annelidica* tend to have acute apices during development and at maturity are quite sharply acute, tapering abruptly to the apex; the mature conidia are curved to sigmoid. The conidiogenous cells are cylindrical, later percurrently proliferating with the annellations closely spaced (1-5µ apart), with no apparent septation between the slightly flared frill of wall tissue which marks each proliferation.

It appears that conidial ontogeny in *F. aquatica* is somewhat different from that in *F. annelidica*. Perhaps after additional study of conidiogenesis in *F. aquatica*, the two taxa may require separation into different genera; in that event, *Rogersia* Shearer & Crane could be resurrected. Until additional evaluation of these two taxa is effected, we suggest the following synonymy:

*Filosporella annelidica* (Shearer & Crane) Crane & Shearer. 1977. Mycotaxon. 6: 28.

*Rogersia annelidica* Shearer & Crane. 1976. Mycologia. 68: 949. (pub. 13 Oct. 1976)

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# NOTES ON HYPHOMYCETES. XXIV. *PHIALOPHORA PINICOLA* SP. NOV. AND *PHIALOPHORA BUBAKII*

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## ABSTRACT

*Phialophora pinicola* Morgan-Jones, a new species, is described and illustrated from isolates from galls caused by *Cronartium quercuum* f.sp. *fusiforme* on *Pinus taeda* in Alabama. It is compared with *Phialophora bubakii* (Laxa) Schol-Schwarz which is similarly treated.

## INTRODUCTION

Two conspecific isolates belonging to the genus *Phialophora* Medlar were obtained during studies on hyphomycetes associated with aecial galls of *Cronartium quercuum* f. sp. *fusiforme* on *Pinus taeda* in Alabama. A comparison with known species of *Phialophora* indicates that they represent an undescribed taxon. The isolates resemble most closely *Phialophora bubakii*, but differ from this species in a number of respects, particularly in the arrangement of the phialides and dimensions of the conidia. A resemblance to *Phialophora lignicola* (Nannfeldt) Goidanich is also evident, but again differences exist in conidium size and in conidium shape. A name is proposed herein to accomodate these isolates. Both the new species and *P. bubakii* are described, the latter from two cultures, including the type.

## TAXONOMIC PART

*Phialophora pinicola* sp. nov. (Fig. 1).

Coloniae in agaro 'malt'dictu vel in agaro decocto tuberorum post 5 dies 25° C ad 4 - 5 cm. diametro, celeriter crescentes, velutinae vel coactae, rubrobrunneae dein atrobrunneae. Hyphae immersae subhyalinae ad pallide brunneae, ramosae, laeves, 3 - 5 μ latae. Hyphae aeriae subhyalinae ad pallide brunneae, ramosae, laeves, interdum funiculosae, 2 - 9 μ latae. Conidiophora semimacronemata, mononemata, simplicia vel ramosa, subhyalina vel pallide

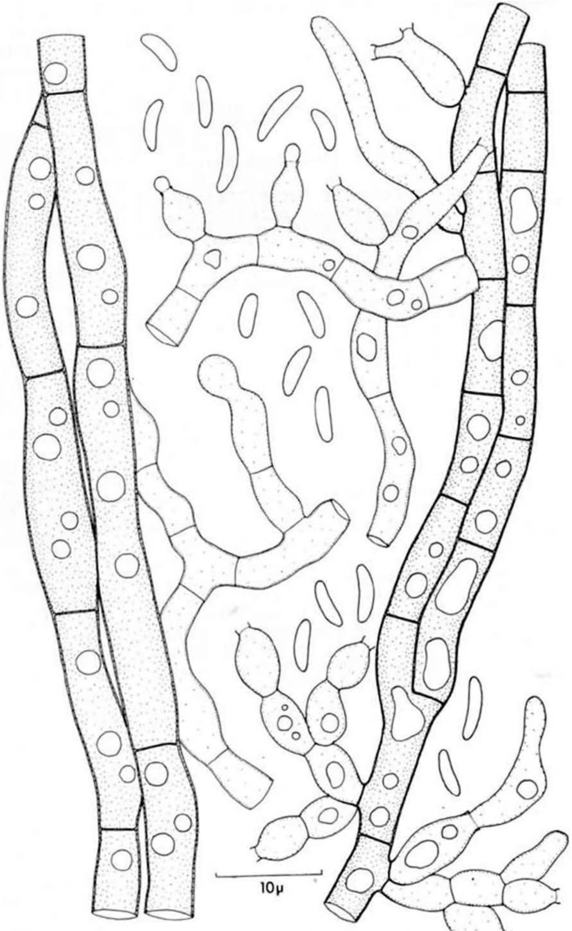

FIGURE 1. *Phialophora pinicola*

brunnea, laevia. Cellae conidiogenae monophialidicae vel polyphialidicae, terminales vel laterales, discretae, ampulliformes, laevis, cum collis minutis, 5 - 9 X 2.5 - 3.5 µ. Conidia hyalina aseptata, allantoidea, laevia, 2.5-5 X 1 µ.

Isolatus ex aecidiis Cronartii, Auburn, Lee County, Alabama, July 15, 1976, W.D. Kelley, CBS 552.76 holotypus.

Colonies on 2% malt agar spreading slowly, at first thin and pale brown, later becoming velvety, dark brown to black, with reverse dark gray, 4 cm. in diameter after 5 days at 25° C. Colonies on PDA growing well, velvety to felted, frequently producing rope-like strands, reddish brown to dark brown, becoming black with age, at first with a faint concentric zonation, aerial hyphae producing a superficial cream to pale brown coloration particularly towards the margin, 5 cm. in diameter after 5 days at 25° C. Colonies on corn meal agar extremely thin, pale brown, with little or no aerial mycelium produced, 3 cm. wide after 5 days at 25° C. Immersed mycelium composed of subhyaline to pale brown, branched, interwoven, smooth, 3 - 5 µ wide hyphae. Aerial hyphae subhyaline to pale brown, branched, smooth, vacuolate, 2 - 9 µ wide; broader hyphae becoming darker and thicker walled with age, frequently aggregated to form hyphal strands. Conidiophores semimacronematous, mononematous, simple or branched, subhyaline to very pale brown, smooth. Conidiogenous cells mono or polyphialidic, terminal or lateral, discrete, ampulliform, smooth, bearing a small collarette, rarely proliferating percurrently, borne in irregular clusters on lateral conidiophores or singly on repent or aerial hyphae, 5 - 9 X 2.5 - 3.5 µ. Conidia hyaline, aseptate, allantoid, smooth, 2.5 - 5 X 1 µ.

On aecial galls of *Cronartium quercuum* (Berk.) Miyabe ex Shirae f. sp. *fusiforme* on *Pinus taeda* L.; North America.

Collections examined: two isolates from *Pinus taeda*, Auburn, Lee County, Alabama, July 15, 1976, W.D. Kelley, CBS 552.76, ATCC 36388 (type); CBS 553.76. Dried cultures in herb AUA, BPI.

*Phialophora bubakii* (Laxa) Schol-Schwarz, Persoonia 6: 66, 1970 (Fig. 2).

≡ *Margarinomyces bubaki* Laxa, Zentbl. Bakteriol. ParasitKde., 2 Abt. 81: 392, 1930.

= *Cadophora obscura* Nannfeldt, Svenska Skogsvardsfören. Tidskr. 32: 418, 1934.

≡ *Phialophora obscura* (Nannf.) Conant, Mycologia 29; 598, 1937.

Colonies on 2% malt agar spreading slowly, at first thin, zonate, later becoming velvety and somewhat funiculose

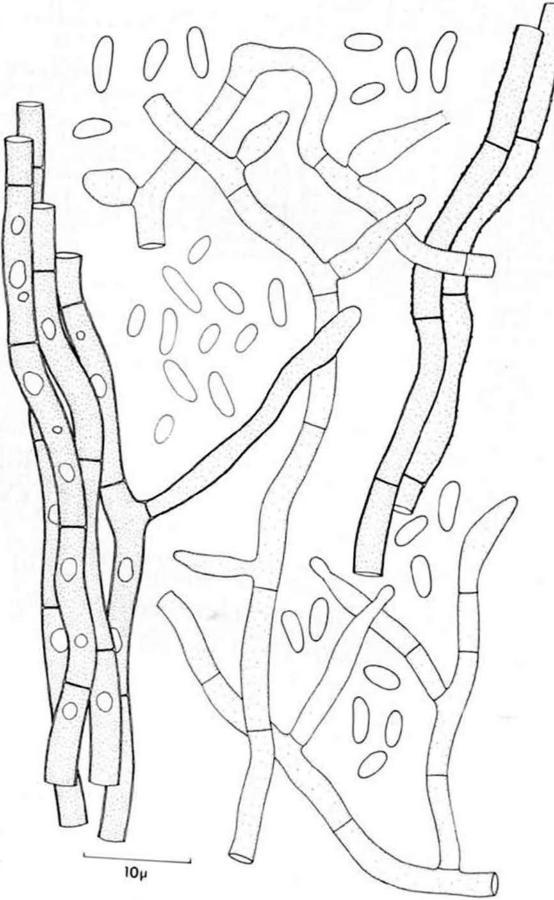

FIGURE 2. *Phialophora bubakii*

towards the center, grayish olive, margin much lighter, with blackish-olive reverse, 2 - 3 cm. in diameter after 5 days at 25° C. Immersed mycelium composed of pale olivaceous brown hyphae, branched, interwoven, smooth, 3 - 4 µ wide. Aerial hyphae subhyaline to olivaceous brown, smooth, often vacuolate, flexuous, becoming thicker-walled and darker with age, sometimes verruculose, frequently aggregated to form hyphal strands up to 30 µ broad, individual hyphae 2.5 - 5 µ wide. Subhyaline to very pale brown, ellipsoid to subglobose chlamydospores sometimes formed laterally on aerial hyphae. Conidiogenous cells monophialidic, terminal or lateral on hyphae, discrete, cylindrical to narrowly flask-shaped, smooth, sometimes proliferating percurrently, usually solitary, more rarely in groups of a few, 6 - 15 X 1.5 - 2 µ. Conidia dimorphic, variable in shape and size, hyaline, aseptate, allantoid or ovoid to elliptical, 2 - 6 X 1 - 3 µ.

Isolated from margarine, fresh water and wood pulp; Europe.

Collections examined: type culture of *Margarinomyces bubaki*, CBS 198.30; isol. sub *Phialophora obscura*, ex wood pulp, Sweden, det. E. Melin, DAOM 29103.

## DISCUSSION

Several morphological features, as well as cultural characteristics, serve to distinguish *P. pinicola* from its nearest relatives. The arrangement of the conidiogenous cells in groups on conidiophores is reminiscent of the structure of *P. lignicola* but in that species the conidia are dimorphic (Schol-Schwarz, 1970). The cylindrical conidia formed in young cultures are appreciably larger than those of *P. pinicola* and the ovoid conidia produced in older cultures are different in shape. *P. bubakii* differs from *P. pinicola* in possessing more slender conidiogenous cells which are usually borne in a solitary manner. The variable conidia of *P. bubakii* further distinguish this species, although *P. bubakii* produces some allantoid conidia that resemble those of *P. pinicola*.

Cole and Kendrick (1973) chose to maintain the generic name *Margarinomyces* Laxa for *P. bubakii*.Whilst admittedly the conidiogenous cells of *P. bubakii* are not as well differentiated as those of other species of *Phialophora*, I do not concur with their view that a separate genus is needed to accommodate this species. The broader generic concept adopted by Schol-Schwarz (1970) and Ellis (1976) fo the genus *Phialophora* is preferable. *P. pinicola*, with its rather more differentiated conidiogenous cells bearing small collarettes, provides a link between *P. bubakii* and the main body of *Phialophora* as presently accepted.

## ACKNOWLEDGEMENTS

I thank Dr. Walter D. Kelley for the opportunity to study his isolates. Dr. Luella K. Weresub, Biosystematics Research Institute, Ottawa, kindly sent on loan the dried culture named *P. obscura* originating in Sweden and Dr. Walter Gams, Centraalbureau voor Schimmelcultures, Baarn, provided the culture of *M. bubakii*. The benefit of consultation with Drs. Gams and G.S. de Hoog is also acknowledged. I am grateful to Dr. Roger D. Goos, University of Rhode Island, for reviewing the manuscript.

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# NOTES ON HYPHOMYCETES. XXV. CONCERNING *EVERSIA SUBOPACA*.

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## ABSTRACT

*Eversia subopaca* (Cooke and Ellis) Crane and Schoknecht is described and illustrated from fresh collections made in Alabama.

## INTRODUCTION

Material of *Eversia subopaca* has recently been collected on rotten decorticated wood in Alabama. Schoknecht and Crane (1977) described this fungus from a number of old collections. Three of these were from Gloucester County, New Jersey, one from Fayette County, West Virginia, and one from Italy; all made during the latter part of the last century. The fifth and only other collection known hitherto, obtained in Japan in 1967 and described by Matsushima (1975) under the name *Cheiromycella annulata*, was also examined by these authors. Detailed description and illustrations are provided herein based on two new collections from Alabama.

## TAXONOMIC PART

*Eversia subopaca* (Cooke and Ellis) Crane and Schoknecht, Mycologia 69: 539, 1977 (Figs. 1 and 2). [for full nomenclator see Schoknecht and Crane (1977)]

Colonies effuse, chocolate brown, with small black areas where conidia are produced, felted. Mycelium partly superficial, mostly immersed, composed of cylindrical, flexuous, heavily branched, septate, subhyaline to pale brown, smooth-walled, 1.5 - 2.5μ wide hyphae. Conidiophores semimacronematous to macronematous, mononematous, simple or frequently branched, erect, abundantly septate, distinctly constricted at the septa, straight or flexuous, smooth, very pale brown, distal conidiogenous cell often noticeably darker and thicker walled than the subtending cells,

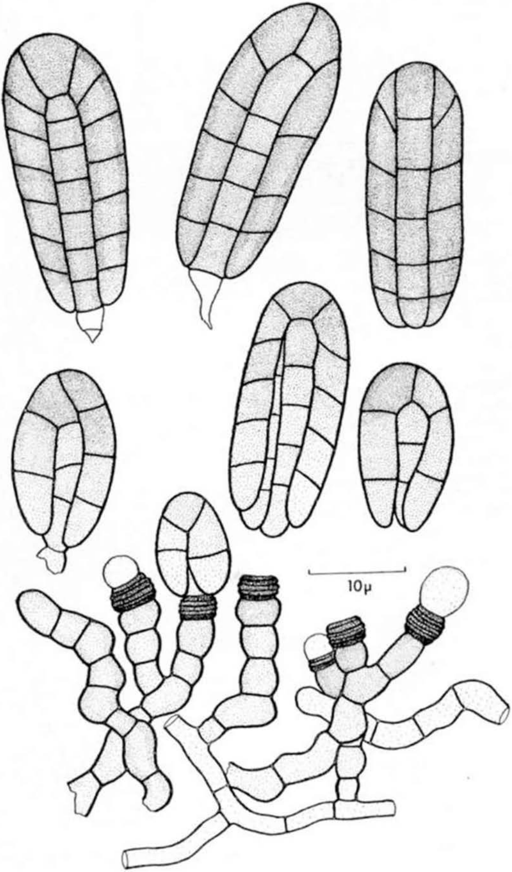

FIGURE 1. *Eversia subopaca*

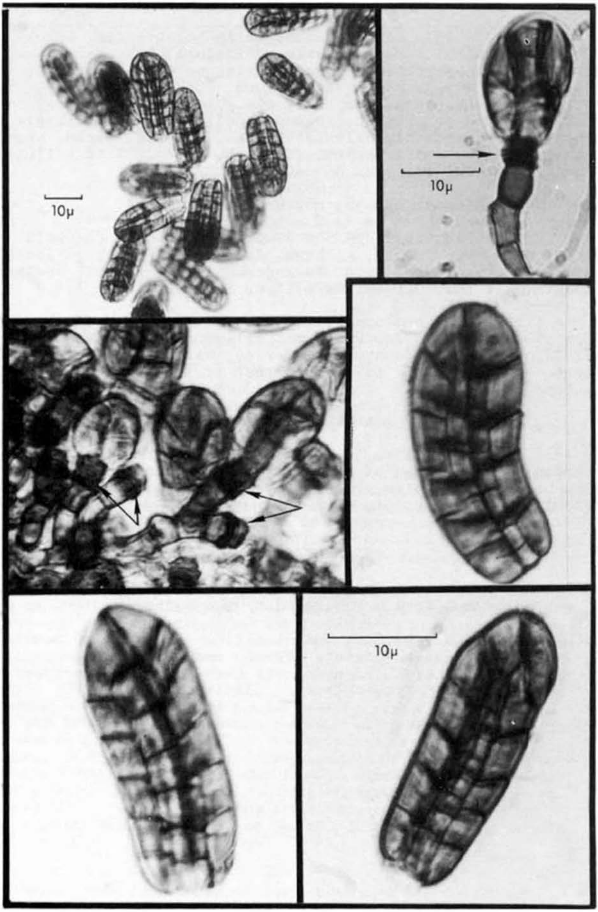

FIGURE 2. *Eversia subopaca.* Arrows indicate conidiophore annellations

15 - 28 X 3 - 4μ. Conidiogenous cells holoblastic, integrated, terminal, indeterminate, doliiform, pale brown, proliferating percurrently and bearing up to seven thick, dark brown, 4 - 5μ wide annellations. Conidia solitary, acrogenous, branched, compactly cheiroid, with a central axis attached to the conidiogenous cell and 2 to 4 closely appressed, downwardly orientated arms, septate, brown, when young tips of arms subhyaline, smooth, 25 - 27 X 10 - 11μ, individual conidial arms 3 - 4μ wide.

On dead wood; Europe, North America, Japan.

Collections examined: on decorticated wood, Chewacla State Park, Lee County, Alabama, July 1976, G. Morgan-Jones, AUA; on decorticated wood, Tuskegee National Forest, Macon County, Alabama, October 1977, R.C. Sinclair, BPI, AUA.

I have also had opportunity to examine the type specimen of *Torula bigemina* Cooke and Ellis, on rotten wood, Newfield, Gloucester County, New Jersey, May 24, 1878, housed in herb, NY. I am able to confirm that it is identical with *E. subopaca*.

## ACKNOWLEDGEMENT

I thank Dr. Clark T. Rogerson, The New York Botanical Garden, for the loan of the material of *T. bigemina* and Dr. Richard T. Hanlin, The University of Georgia, for reviewing the manuscript.

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# SYNOPSIS OF WOOD-ROTTING FUNGI ON SPRUCE IN NORTH AMERICA: II[1]

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## *SUMMARY*

Ninety-nine species of wood-rotting basidiomycetes in the family Polyporaceae are reported to occur on eight species of North American spruces.

The first part of this series (Martin and Gilbertson, 1977) included keys to higher taxa and a synopsis of the Corticiaceae. Part II is a synopsis of the family Polyporaceae sensu stricto. In this restricted sense the polyporoid genera of the Hymenochaetaceae are excluded and will be treated in part III. *Ganoderma* is included although commonly placed in the family Ganodermataceae in recent literature.

The taxonomy of the Polyporaceae is currently in a state of flux due to efforts to determine natural generic groupings and a general move away from the practical but artificial Friesian system. As a result many genera have been proposed and the nomenclatural validity and taxonomic merit of all these taxa have yet to be elucidated. Recent workers who have made important contributions in this area are Donk (1960, 1974), W. B. Cooke (1960), Pegler (1966), and Ryvarden (1976). Ryvarden's manual for identification of Polyporaceae of North Europe probably best exemplifies current trends in polypore taxonomy. He recognizes 62 genera in a mycoflora that approximates that of North America. The genera reported in this synopsis of spruce-decaying polypores are, for the most part, also found in Ryvarden's work. A major difference is that we have utilized the artificial genus *Poria* to accommodate species with resupinate basidiocarps. We prefer to follow this expedient until the taxonomy of this difficult group is more

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1/ University of Arizona Agricultural Experiment Station Journal Article No. 2818.

firmly stabilized. More detailed information on pileate North American polypores can be found in Overholts (1953). Lowe (1966) has published a comprehensive treatment of the resupinates.

Species of spruce are denoted by numbers as follows: 1, *Picea breweriana*; 2, *P. engelmannii*; 3, *P. glauca*; 4, *P. mariana*; 5, *P. pungens*; 6, *P. rubens*; 7, *P. sitchensis*; 8, *P. chihuahuana*; 9, *Picea* sp.

Abbreviations designating geographical localities are AK, Alaska; AZ, Arizona; AT, Alberta; BC, British Columbia; CA, California; CO, Colorado; CH, Chihuahua; CT, Connecticut, ID, Idaho; MA, Massachusetts; MB, Manitoba; ME, Maine; MI, Michigan; MN, Minnesota; MT, Montana; NB, New Brunswick; NC, North Carolina; NF, Newfoundland; NH, New Hampshire; NM, New Mexico; NWT, Northwest Territories; NS, Nova Scotia; NY, New York; OR, Oregon; OT, Ontario; PA, Pennsylvania; PEI, Prince Edward Island; QB, Quebec; SK, Saskatchewan; SD, South Dakota; TN, Tennessee; UT, Utah; VT, Vermont; WA, Washington; WS, Wisconsin, WY, Wyoming, YT, Yukon Territory.

## Family POLYPORACEAE

### Key to the genera

1. Basidiocarps stipitate, sessile or effused-reflexed, sometimes resupinate at first . . . . . . . . . . . . . . . . . . . . . 2
1. Basidiocarps typically resupinate at all stages of development (see also *Coriolellus*). . . *Poria* Pers. ex S.F. Gray
    2. Basidiospores brown, truncate, with a pitted exospore . . . . . . . . . . . . . . . . . . . . . . . . *Ganoderma* Karst.
    2. Basidiospores hyaline, not with a pitted exospore . . . . 3
3. Basidiocarps annual, rarely reviving a second year . . . . . 4
3. Basidiocarps perennial, tubes typically stratified . . . . . . . . . . . . . . . . . . . . . . . . *Fomitopsis* Karst.
    4. Hymenophore in form of united tubes, or sometimes becoming hydnaceous from splitting of tubes . . . . . . . . . . . 5
    4. Hymenophore in form of radial lamellae (See also *Hirschioporus laricinus*) . . . . . . . . *Gloeophyllum* Karst.
5. Context tissue brown, bright colored, or whitish, if turning red in KOH solution then tissue bright colored . . . . . . . . . 6
5. Context tissue brown, turning red to purplish in KOH solution . . . . . . . . . . . . . . . . . . *Hapalopilus* Karst.

*Hapalopilus nidulans* (Fr.) Karst. Basidiocarps sessile, dimidiate, upper surface and pore surface yellowish brown; hyphal system dimitic, generative hyphae with clamps; basidiospores ovoid to ellipsoid, 3-4 x 2-3 µm. White rot on 2 in AZ.

    6. Contextual generative hyphae septate, with or without clamps; cystidia absent or if present barely projecting and/or incrusted . . . . . . . . . . . . . . . . . . . . . . . . 7
    6. Contextual hyphae simple-septate; large non-incrusted cystidia present . . . . . . . . . . . *Phaeolus* (Pat.) Pat.
7. Generative hyphae simple-septate (See also *Tyromyces mollis*). 8
7. Generative hyphae with clamps, sometimes difficult to find in some species with a dimitic hyphal system . . . . . . . 9

8. Basidiocarps stipitate; upper surface yellowish to tan or purplish brown; pore surface whitish; basidiospores spiny, amyloid . . . . . . . . . . . . . . . . . . *Bondarzewia* Sing.
8. Basidiocarps sessile or substipitate; upper surface orange; pore surface sulfur yellow; basidiospores smooth, not amyloid . . . . . . . . . . . . *Laetiporus* Murr.

*Laetiporus sulphureus* (Bull. ex Fr.) Bond. et Sing. Basidiocarps often densely imbricate, bleaching to a white crumbly mass after weathering; contextual hyphae of two types, some thin- to thick-walled, aseptate, much branched and interlocking; others thin-walled, simple-septate, rarely branched; basidiospores ovoid to ellipsoid, 5-7.5 x 4-5 µm. Brown rot on 2 in BC, ID; 3 in BC, ME; 7 in AK, BC, OR, WA.

9. Basidiocarps centrally to laterally stipitate . . . . . . . . 10
9. Basidiocarps sessile or effused-reflexed . . . . . . . . . . . 12
10. Basidiocarps fibrous to corky when dried . . . . . . . . . 11
10. Basidiocarps hard and bone-like on drying . . . *Osteina* Donk

*Osteina obducta* (Berk.) Donk. Pileus circular, dimidiate, or spathulate; upper surface light buff to grayish; pore surface cream-colored to yellowish; basidiospores oblong-ellipsoid, 4-6 x 2-2.5 µm. Brown rot on 2 in CO; 7 in BC.

11. Basidiocarps usually consisting of a single pileus on an unbranched stipe . . . . . . *Polyporus* Mich. ex Fr. emend Donk
11. Basidiocarps consisting of numerous small pilei on branches from a common stipe . . . . . . . . . . . . *Polypilus* Karst.

*Polypilus umbellatus* (Pers. ex Fr.) Bond. et Sing. Basidiocarps whitish to grayish brown; pore surface white, drying yellowish; stem arising from an underground tuber-like sclerotium; hyphal system dimitic with branching skeletal hyphae; basidiospores cylindric-ellipsoid, 7-10 x 3-4 µm. On 2 in MT.

12. Upper surface of basidiocarps glabrous to hispid; basidiospores cylindric . . . . . . . . . . . . . . . 13
12. Upper surface of basidiocarps coarsely radially fibrillose; basidiospores ovoid . . . . *Abortiporus* Murr.

*Abortiporus borealis* (Fr.) Sing. Basidiocarps sessile or substipitate, white when fresh, drying yellowish; context two-layered, upper layer thin, soft and floccose; lower layer fibrous and hardening; cystidia ventricose or fusoid, thick-walled above, thin-walled below; basidiospores 4.5-7 x 3.5-5 µm. White butt and root rot on 2 in AZ, BC, CO, ID, MT, OR; 3 in BC, MN, NB; 4 in MN; 6 in NB, NS, NY, TN, VT; 7 in AK, BC, OR; 9 in NB, NS.

13. Hyphal system monomitic although some hyphae may become thick-walled . . . . . . . . . . . . . . . . . . . . . . . . 14
13. Hyphal system dimitic or trimitic with distinct generative and skeletal hyphae . . . . . . . . . . . . . . . . . . . . . 17
14. Pore surface of various colors but not smoky gray . . . . 15
14. Pore surface smoky gray . . . *Bjerkandera* Karst. emend. Murr.

*Bjerkandera adusta* (Willd. et Fr.) Karst. Basidiocarps sessile or effused-reflexed, usually imbricate, usually less than 1 cm thick; upper surface whitish or cinereous to smoke gray or pale tan; tramal tissue pale brownish in KOH; dark layer at base of tubes usually distinct; pores minute, 5-7 per mm; basidiospores short-cylindric, 5.5-5 x 2.5-3 µm. White rot on 2 in MT; 3 in BC, MN, YT; 7 in OR.

15. Context fibrous or corky, no gelatinous layer between tubes and upper context; associated with white or brown rots . . . . . . 16
15. Context with a gelatinous layer between tubes and upper context; associated with a white rot . . . . . . *Gloeoporus* Mont.

*Gloeoporus dichrous* (Fr.) Bres. Basidiocarps sessile or effused-reflexed; often imbricate; upper surface gray to buff, zonate; margin ivory; pore surface pale to dark purplish; hyphae of lower context thin-walled; hyphae of upper context thick-walled; basidiospores allantoid, 4-6 x 1 µm. On 2 in MT; 6 in NY.

16. Contextual hyphae, tramal hyphae, and cystidia, if present, not amyloid . . . . . . . . . . . . . . . . *Tyromyces* Karst.
16. Contextual hyphae, tramal hyphae, and cystidia amyloid, at least in part . . . . . . . . . . *Amylocystis* Bond. et Sing.

*Amylocystis lapponica* (Rom.) Bond. et Sing. Basidiocarps sessile, whitish, becoming reddish brown on bruising or drying; upper surface often hispid; hyphae thin- to thick-walled; cystidia bottle-shaped or cylindric, frequently incrusted at the apex; basidiospores cylindric, 8-11 x 2.5-3.5 µm. Brown cubical rot on 2 in AT, AZ, BC, MT, UT; 3 in AT, BC, NH; 6 in NH; 7 in BC; 9 in AZ, BC, CO, WY.

17. Pore surface not purplish; cystidia absent or if present, not incrusted . . . . . . . . . . . . . . . . . . . . . . . . . 18
17. Pore surface purplish when fresh; capitately incrusted cystidia present . . . . . . . . . . . . . . . . . *Hirschioporus* Donk
    18. Pore surface exposed, volva not present . . . . . . . . . 19
    18. Pore surface enclosed in a volva with a small basal opening . . . . . . . . . . . . . . *Cryptoporus* (Pk.) Shear

*Cryptoporus volvatus* (Pk.) Hubbard. Basidiocarps sessile, ungulate; upper surface cream colored to yellowish or tan, often coated with a clear lacquer-like layer; pore surface pale to dark chocolate brown; hyphal system trimitic; generative hyphae with irregular swellings; basidiospores cylindric, 9.5-12 x 3.5-4 µm. White rot on 2 in CO, MT, OR; 3 in AT, BC, MB, NWT, QB, OT; 7 in BC, OR, WA.

19. Context, upper surface, and pore surface of various colors but not reddish orange . . . . . . . . . . . . . . . . . . . . . 20
19. Context, upper surface, and pore surface reddish orange . . . . . . . . . . . . . . . . . . . . . . . . *Pycnoporus* Karst.

*Pycnoporus cinnabarinus* (Jacq. ex Fr.) Karst. Basidiocarps sessile or effused-reflexed, dimidiate to elongated; hyphal system trimitic; hyphal pegs abundant; basidiospores short-cylindric, straight or slightly curved, 6-8 x 2.5-3 µm. White rot on 2 in CT, ME, NH, NS, NY; 9 in NC, NY.

20. Pore surface white to cream colored or brownish; context thick or thin . . . . . . . . . . . . . . . . . . . . . . 21
20. Pore surface orange to pinkish; context thin . . . . . . . . . . . . . . . . . . *Skeletocutis* Kotl. et Pouz.

*Skeletocutis amorphus* (Fr.) Kotl. et Pouz. Basidiocarps effused-reflexed to resupinate; upper surface grayish to light buff, tomentose to hirsute; margin usually undulate; hyphal system dimitic, generative hyphae becoming thick-walled; basidiospores allantoid, 3-4.5 x 0.5-1 µm. White rot on 2 in BC, ID, MT; 3 in BC; 7 in AK; 9 in AK, PA.

21. Skeletal hyphae not branching dendritically . . . . . . . . . 22
21. Skeletal hyphae branching dendritically . . . *Dichomitus* D. Reid

*Dichomitus squalens* (Karst.) D. Reid. Basidiocarps usually effused-reflexed, often imbricate, upper surface white to pale reddish brown; pore surface white; hyphal system dimitic; basidiospores cylindric, 8-12 x 3-4 µm. White rot of 2 in AZ, CO, MT, NM; 3 in AK, MB, MN, NS, NWT, SK; 4 in MN, NB, NF, NY; 6 in CT, ME, NH, NY, VT; 7 in AK; 9 in OT.

22. Upper surface of basidiocarps of various shades of white, gray, yellowish, brownish or blackish, if reddish brown not becoming radially rugose . . . . . . . . . . . . . . . . . . 23
22. Upper surface of basidiocarps dark reddish brown and becoming radially rugose . . . . . . . . . . *Ischnoderma* Karst.

*Ischnoderma resinosum* (Schrad. ex Fr.) Karst. Basidiocarps sessile or effused-reflexed, solitary or imbricate; pore surface cream colored to pinkish buff, turning darker brown where bruised; tubes separated from context by a thin, dark layer; hyphal system dimitic; basidiospores cylindric, often curved, 5-7 x 1.5-2 µm. White rot on 2 in ID, MT; 3 in BC; 6 in CT, ME, NH, NY; 7 in WA; 9 in NS, NY.

23. Pores typically daedaloid or sometimes lamellate . . . . . . 24
23. Pores circular to angular, not typically daedaloid . . . . . 25
24. Basidiocarps sessile, dimidiate; upper surface grayish to brownish . . . . . . . . . . . . . *Daedaleopsis* Schroet.

*Daedaleopsis confragosa* (Bolt. ex Fr.) Schroet. Surface of pileus zonate; hyphal system trimitic; basidiospores cylindric, slightly curved, (6)8-11 x 2-3 µm, 2-3 guttulate. White rot on 9.

24. Basidiocarps thin, effused-reflexed; upper surface becoming blackish . . . . . . . . . . . . . . . . . . . . *Datronia* Donk

*Datronia mollis* (Sommerf. ex Fr.) Donk. Surface of pileus often with irregular concentric zones, covered with a thin crust; margin sharply delineated, more or less undulate; basidiospores cylindric, slightly curved, 8-10 x 2.5-3.5 µm. On 3 in AT.

25. Basidiocarps thin, coriaceous; upper surface tomentose to hirsute, usually zonate and sulcate; associated with a white rot . . . . . . . . . . . . . . . . . . . . . . . . . . . *Coriolus* Quél.
25. Basidiocarps thin to thick; upper surface not distinctly zonate and sulcate; associated with a brown or white rot . . 26
    26. Tissue white to brownish, if brown then pores more or less hexagonal; fresh basidiocarps and rot not with an anise odor . . . . . . . . . . . . . . . . . . . . . . . . . . 27
    26. Tissue brownish, pores circular or daedaloid; fresh basidiocarps and rot with an anise odor . . . . . . *Osmoporus* Sing.

*Osmoporus odoratus* (Wulf. ex Fr.) Sing. Basidiocarps sessile or effused-reflexed; upper surface rusty brown, coarsely strigose to tomentose or darkening and glabrous with age; pore surface yellowish brown, pores 2-3 per mm; hyphal system dimitic; basidiospores cylindric, 9-13 x 3.5-5 µm. Brown rot on 3 in AK, YT; 9 in NB, NS.

27. Pores usually large, 1-5 per mm; associated with a brown rot . . . . . . . . . . . . . . . . . . . . . . . . . *Coriolellus* Murr.
27. Pores usually small, 4-10 per mm; associated with a white rot . . . . . . . . . . . . . . . . . . . . . . . . . . *Tyromyces* Karst.

### Key to species of *Bondarzewia*

1. Upper surface of basidiocarps yellowish to tan; basidiospores 7-8 x 6-7 µm

*Bondarzewia berkeleyi* (Fr.) Bond. et Sing. Basidiocarps with one to several pilei; upper surface often radiately rugose or pitted, sometimes obscurely zoned; pore surface whitish, discoloring on drying; pores unequal, sometimes lacerated or toothed. White rot on 7 in CA, BC.

1. Upper surface of basidiocarps purplish brown; basidiospores 6-7 x 5-6 µm

*Bondarzewia montana* (Quél.) Sing. Basidiocarps usually with a single pileus; upper surface covered with velvety pubescence; context white, spongy, drying hard; pore surface whitish, drying darker; pores 1-2 per mm. On 7 in BC.

### Key to species of *Coriolellus*

1. Context and pore surface whitish; pores not appearing hexagonal 2
1. Context and pore surface brown; pores appearing hexagonal

*Coriolellus carbonarius* (Berk. et Curt.) Bond. Basidiocarps effused-reflexed, sessile, or resupinate; upper surface light brown; pores 2-3 per mm; hyphal system dimitic, generative hyphae with clamps; basidiospores allantoid, 7-9 x 2.5-3 µm. Brown rot on 2 in AZ.

2. Basidiocarps usually resupinate . . . . . . . . . . . . . 3
2. Basidiocarps usually sessile or effused-reflexed . . . . 4

3. Pores large, often up to 2 mm in diam

*Coriolellus alaskanus* (Baxter) comb. nov. (basionym: *Trametes alaskana* Baxter, Mich. Acad. Sci. Arts, Lett. Papers 27:150. 1942). Basidiocarps creamy white when fresh, drying cream to buff; hyphal system trimitic, generative hyphae with clamps; basidiospores cylindric, 7-8 x 2.5-3 µm. Brown rot on 3 in AK; 7 in AK.

3. Pores small, 2-5 per mm

*Coriolellus serialis* (Fr.) Murr. Upper surface of basidiocarps cream colored or drying to buff; taste bitter anise; pore surface ivory; hyphal system trimitic, generative hyphae with clamps; basidiospores cylindric, 8-11 x 2.5-4 µm. Brown rot on 2 in AT, AZ, BC, CO, ID, MT, UT: 3 in AK, AT, BC, NWT, QB, SK, YT; 4 in AT, BC, MN, NF, NWT, QB; 5 in CO; 6 in CT, ME, NH, NY, PA; 7 in AK, BC, OR, QB, WA; 9 in AT, MN.

4. Basidiospores mostly more than 10 µm long . . . . . . . . 5
4. Basidiospores 7-10 µm long

*Coriolellus variiformis* (Pk.) Sarkar. Upper surface of basidiocarps reddish brown; pore surface white to ivory; pores angular, often becoming daedaloid, 1-2 per mm; hyphal system trimitic, generative hyphae with rare clamps; basidiospores cylindric to ellipsoid, 7-10 x 3-4 µm. Brown rot on 2 in BC, ID, MT, UT; 3 in AK, AT, BC, MB, MN, SK, YT; 4 in MN; 6 in ME, NB, NF, NH, NY, QB, OT, VT; 7 in AK, BC, WA; 9 in AT, NB, NS.

5. Basidiospores 12-14 µm long; pores 1-3 mm in diam

*Coriolellus heteromorphus* (Fr.) Bond. et Sing. Upper surface of basidiocarps ivory white to pale brownish; pore surface ivory white; hyphal system dimitic, generative hyphae with clamps; basidiospores cylindric, curved near the apiculus, 12-14 x 4-5 µm. Brown rot on 2 in AT, BC, CO, ID; 3 in AK, AT, BC, NB, NS, NWT, YT; 4 in AT, NF, NS; 6 in CT, ME, NH, NY: 7 in AK, BC, WA: 9 in BC, NS.

5. Basidiospores 8-12 µm long; pores 1-2 per mm

*Coriolellus sepium* (Berk.) Murr. Upper surface of basidiocarps almost white or often pale tan to gray; pore surface pale tan; hyphal system dimitic; generative hyphae with clamps; basidiospores cylindric, 8-12 x 2.5-4 µm. Brown rot on 3 in AK, YT; 6 in CT, ME, NH, NY; 7 in OR; 9 in AT.

### Key to species of *Coriolus*

1. Upper surface of basidiocarps distinctly zonate with multicolored zones; upper context separated from lower context by a thin dark layer

*Coriolus versicolor* (L. ex Fr.) Quél. Basidiocarps thin, sessile, effused-reflexed, or imbricate; zones in shades of gray, blue, reddish brown, and tan; pore surface white to buff; hyphal system trimitic, generative hyphae with clamps; basidiospores cylindric, slightly curved, 5.5-6 x 1.5-2 µm. White rot on 2 in ID, OR, WA; 6 in CT, ME, NH, NY; 7 in AK, CA, OR, WA; 9 in NB, PA.

1. Upper surface of basidiocarps azonate; upper context not separated from lower context by a thin dark layer

*Coriolus pubescens* (Schwm. ex Fr.) Quél. Basidiocarps sessile, dimidiate, often imbricate; upper surface whitish to yellowish; pore surface whitish; hyphal system trimitic, generative hyphae with clamps; basidiospores cylindric, slightly curved, 4.5-7.5 x 2-3 µm. White rot on 2 in MT; 3 in BC.

## Key to species of *Fomitopsis*

1. Context and pore surface rose colored . . . . . . . . . . . . . 2
1. Context and pore surface white or pale buff, not rose colored . 3
    2. Basidiocarps usually ungulate; basidiospores straight, 5-8 x 2-3 µm

*Fomitopsis rosea* (Alb. et Schw. ex Fr.) Karst. Upper surface of basidiocarps rose colored at first, becoming purplish brown to blackish, frequently covered by a rimose crust; hyphal system dimitic, generative hyphae with clamps; basidiospores oblong-ellipsoid to subcylindric. Brown rot on 2 in AZ, BC, CO, ID, MT, NM, UT; 3 in AK, BC, NB, NWT, OT, QB, SK, YT; 4 in MN, NB; 5 in CO; 6 in CT, ME, NB, NH, NS, NY; 7 in WA; 9 in MN, NB, NS, NY, PA, PEI.

2. Basidiocarps usually applanate; basidiospores curved, 5-8 x 1.5-2.5 µm

*Fomitopsis cajanderi* (Karst.) Kotl. et Pouz. Basidiocarps sessile or somewhat effused-reflexed, occasionally imbricate; upper surface sometimes sulcate, brownish pink, grayish to blackish in older parts; hyphal system dimitic; generative hyphae with clamps. White rot on 2 in AT, AZ, BC, ID, MT; 3 in AT, BC, NB, NS, MB, NH, SK, NWT; 4 in AT, MN, NB, OT; 6 in NB, NY; 7 in OR, WA; 9 in MN, NB, NS, NY, PA, PEI.

3. Context tough-corky; tissue not bitter . . . . . . . . . . . . 4
3. Context chalky and crumbly; tissue bitter

*Fomitopsis officinalis* (Vill. ex Fr.) Bond. et Sing. Basidiocarps ungulate to columnar; upper surface white to buff, becoming rimose; pore surface whitish; hyphal system dimitic; generative hyphae with clamps; gloeoplerous hyphae present; basidiospores ovoid, 4-7 x 3-3.5 µm. Brown rot on 2 in BC, ID; 4 in MN; 7 in AK, BC, OR, WA.

4. Basidiocarps usually sessile, applanate to ungulate; generative hyphae with clamps; basidiospores cylindric

*Fomitopsis pinicola* (Swartz ex Fr.) Karst. Upper surface of basidiocarps brownish, blackish, or reddish, often with a bright reddish, resinous margin; pore surface cream colored; hyphal system dimitic; cystidia hyphoid; basidiospores 6.5-7.5 x 3-4 µm. Brown rot of 2 in AZ, BC, CO, ID, MT, OR, UT, WY; 3 in AK, AT, BC, MB, NS, NWT, OT, SK, YT; 4 in MN, NB, NS, NWT, OT, QB, WS; 5 in CO; 6 in CT, ME, NB, NH, NS, NY, TN; 7 in AK, BC, OR, WA; 9 in BC, NB, NS, NWT, PEI.

4. Basidiocarps usually resupinate or effused-reflexed, rarely sessile; generative hyphae simple-septate; basidiospores subglobose

*Fomitopsis annosa* (Fr.) Karst. Upper surface of basidiocarps crustlike, brownish with age, indistinctly zonate and sulcate; pore surface cream colored; hyphal system dimitic; basidiospores 4-4.5 x 3-4.5 µm. White pocket rot of 2 in ID, NM, OR, WA; 3 in BC, MN; 6 in ME, VT; 7 in AK, BC, CA, OR, WA.

### Key to species of *Ganoderma*

1. Basidiocarps annual, context pale brownish to ivory; upper surface usually appearing varnished . . . . . . . . . . . . . . . . . 2
1. Basidiocarps perennial; context purplish brown to reddish brown; upper surface usually dull

*Ganoderma applanatum* (Pers. ex Wallr.) Pat. Basidiocarps sessile, usually applanate; upper surface usually grayish or grayish black, covered with a hard crust; pore surface white, darkening quickly on bruising; hyphal system trimitic; generative hyphae with clamps; basidiospores ellipsoid, truncate at one end, 6.5-8.5 x 4.5-6 µm. White mottled rot of 2 in ID; 3 in BC; 7 in AK, BC, CA, WA; 9 in NS.

2. Pileus not more than 5 cm thick; basidiospores 9-11 x 6-8 µm

*Ganoderma tsugae* Murr. Basidiocarps up to 30 cm wide, often centrally to laterally stipitate; tube layers up to 1 cm thick. White rot of 9 in NS.

2. Pileus typically 7-12 cm thick; basidiospores 10-16 x 7-9 µm

*Ganoderma oregonense* Murr. Basidiocarps becoming .75 m or more wide, usually sessile; tube layers up to 2 cm thick. White rot of 7 in AK, BC, OR, WA.

### Key to species of *Gloeophyllum*

1. Upper surface of basidiocarps usually zonate, often with bright yellowish or reddish brown zones; context often up to 3-4 mm thick

*Gloeophyllum saepiarium* (Wulf. ex Fr.) Karst. Basidiocarps effused-reflexed to sessile, occasionally resupinate; hyphal system dimitic, generative hyphae with clamps; cystidia cylindric, smooth or sparsely incrusted; basidiospores cylindric, 8-11 x 3-3.5 µm. Brown rot on 2 in AT, AZ, CO, ID, MT, NM, VT, WA, WY; 3 in AK, AT, BC, ME, NB, NS, NY, NWT, OT, PEI, VT, YT; 4 in AT, BC, MN, NB, NY, NWT, OT; 5 in AZ; 6 in CT, ME, NH, NS, NY; 7 in AK, BC, OR, WA; 9 in AT, NB, NF, NS, PEI.

1. Upper surface of basidiocarps azonate or indistinctly zonate, dull brown; context seldom more than 1 mm thick

*Gloeophyllum trabeum* (Pers. ex Fr.) Murr. Basidiocarps sessile, effused-reflexed, or sometimes resupinate; hyphal system dimitic, generative hyphae with clamps; cystidia cylindric, smooth; basidiospores cylindric, 7.5-9 x 3-3.5 µm. Brown rot on 6 in CT, ME, NH, NY; 9 in NY, PA.

### Key to species of *Hirschioporus*

1. Hymenophore poroid or becoming hydnaceous

*Hirschioporus abietinus* (Dicks. ex Fr.) Donk. Basidiocarps usually effused-reflexed, sometimes sessile or resupinate; pilei solitary or imbricated; upper surface grayish, hirsute; context duplex, upper layer whitish, soft, lower layer buff, corky; hyphal system dimitic, generative hyphae with clamps; basidiospores cylindric, 6-7.5 x 2.5-3 µm. White rot on 2 in AZ, CO, ID, MT, OR, VT, WA, WY; 3 in AK, AT, BC, ME, NB, NS, NWT, OT, PEI, YT; 4 in NB, NF, NS, NWT, OT, PEI, QB; 6 in CT, ME, NB, NH, NS, NY, PA; 7 in AK, BC, WA; 9 in BC, NB, NS, OT, PEI.

1. Hymenophore strongly lamellate

*Hirschioporus laricinus* (Karst.) Teramoto. Basidiocarps effused-reflexed or resupinate; upper surface tan to gray, hirsute, faintly zonate; context pale purplish brown; hyphal system dimitic, generative hyphae with clamps; basidiospores allantoid, 6-7 x 2-2.5 µm. White rot on 6 in NY.

### Key to species of *Phaeolus*

1. Basidiocarps effused-reflexed or resupinate; pore surface and context bright orange . . . . . . . . . . . . . . . . . . . . . 2
1. Basidiocarps stipitate to sessile; context brownish; pore surface greenish-brown when fresh

*Phaeolus schweinitzii* (Fr.) Pat. Pilei solitary or imbricate, circular or irregularly lobed; upper surface yellowish brown when fresh, drying to dark reddish brown, tomentose to hirsute, faintly zonate; hyphae simple-septate, brownish in KOH solution; cystidia cylindric, yellowish; basidiospores ellipsoid to ovoid, 6-9 x 3.5-5 µm. Brown cubical root and butt rot on 2 in AZ, ID, MT, OR; 3 in BC, MB, NB, NS, NWT, OT; 4 in MN, OT; 6 in MA, ME, NY, VT; 7 in AK, BC, CA, OR, WA; 9 in NB, NS, PEI.

2. Pores 1 mm or more in diam; basidiospores 10-14 μm long

*Phaeolus alboluteus* (Ell. et Ev.) Pilát. Basidiocarps effused-reflexed or commonly resupinate, often effused for several feet, developing in early spring in snow and deteriorating rapidly after snow melts; upper surface soft and spongy; hyphae simple-septate; cystidia abundant, cylindric, projecting up to 80 μm; basidiospores cylindric, 10-14 x 3-4 μm. Brown rot on 2 in AZ, BC, CO, ID, MT, OR, UT, WA, WY; 3 in AK, BC; 4 in MI, 5 in AZ; 6 in NY; 7 in AK, BC, WA; 9 in AT.

2. Pores 2-3 per mm; basidiospores 5-6 μm long

*Phaeolus fibrillosus* (Karst.) Bourd. et Galz. Basidiocarps usually pileate; hyphae simple-septate; cystidia not abundant, cylindric; basidiospores oblong-ellipsoid, 4-5 x 2.5-3 μm. Brown rot on 2 in ID, MT, OR; 3 in AK, BC; 4 in MN; 6 in NC, NY; 7 in AK, BC, OR, WA; 9 in NC.

### Key to species of *Polyporus*

1. Hyphal system dimitic or trimitic; surface of basidiocarps not hispid or scurfy . . . . . . . . . . . . . . . . . . . . . 2
1. Hyphal system monomitic; upper surface of basidiocarps grayish to purplish brown, usually hispid or scurfy

*Polyporus hirtus* Quél. Pores 1-2 per mm; hyphal system monomitic; hyphae thin-walled, abundantly nodose-septate; basidiospores fusiform, 13-17 x 4.5-5.5 μm. White rot of 2 in AZ; 3 in BC; 6 in NF; 9 in AZ.

2. Upper surface of basidiocarps ochraceous to dark chestnut brown, not striate . . . . . . . . . . . . . . . . . . . . . 3
2. Upper surface of basidiocarps pale brownish with light colored radial striations

*Polyporus varius* Pers. ex Fr. Basidiocarps centrally to laterally stipitate, up to 10 cm wide; basidiospores 7-12 x 3-4 μm. White rot of 2 in ID; 3 in AT.

3. Basidiocarps lignicolous, on wood above ground; upper surface glabrous . . . . . . . . . . . . . . . . . . . . . . . . . 4
3. Basidiocarps terrestrial, on buried wood; upper surface finely velvety

*Polyporus melanopus* Fr. Basidiocarps centrally stipitate; stipe velvety above black base; basidiospores 8-12 x 3.5-4 μm. White rot of 2 in MT.

4. Upper surface of basidiocarps pale tan to dull tan, weathering to white

*Polyporus elegans* Bull. ex Fr. Basidiocarps centrally to laterally stipitate, up to 5 cm wide; basidiospores 6-10 x 2.5-3.5 μm. White rot of 3 in AT, BC; 9 in NWT.

4. Upper surface of basidiocarps light chestnut brown to blackish

*Polyporus picipes* Fr. Basidiocarps centrally to laterally stipitate, often lobed or imbricate and growing in clusters, up to 15 cm wide; basidiospores 6-8 x 3-4 µm. White rot of 7 in AK, BC.

## Key to species of *Poria*

1. Hyphal system monomitic . . . . . . . . . . . . . . . . . . . . . . 2
1. Hyphal system dimitic or trimitic . . . . . . . . . . . . . . . . . 20
    2. Hyphae with clamp connections . . . . . . . . . . . . . . . . 3
    2. Hyphae simple-septate . . . . . . . . . . . . . . . . . . . . 13
3. Pore surface lavender or yellow . . . . . . . . . . . . . . . . . 4
3. Pore surface white to cream colored . . . . . . . . . . . . . . . 5
    4. Margin with yellow rhizomorphs; pore surface pale yellow

*Poria albolutescens* (Rom.) Egeland. Basidiospores oval to ellipsoid, 3.5-5 x 2.5-3 µm, amyloid in Melzer's reagent. Brown rot of 2 in CO.

4. Margin not rhizomorphic; pore surface variable in color, lavender to pale yellow

*Poria bombycina* (Fr.) Cke. Basidiospores broadly ellipsoid, 5-8 x 3-5 µm, weakly amyloid in Melzer's reagent. Brown rot of 2 in CO; 9 in AT, BC.

5. Basidiospores ellipsoid to subglobose . . . . . . . . . . . . . 6
5. Basidiospores cylindrical . . . . . . . . . . . . . . . . . . . 10
    6. Basidiocarps not rhizomorphic . . . . . . . . . . . . . . . 7
    6. Basidiocarps rhizomorphic . . . . . . . . . . . . . . . . . 9
7. Basidiospores hyaline; spore print white . . . . . . . . . . . 8
7. Basidiospores becoming brown at maturity; spore print brown

*Poria incrassata* (Berk. et Curt.) Burt. Pore surface buff, becoming grayish brown in drying; basidiospores narrowly to broadly ellipsoid, negative in Melzer's reagent, 7-13 x 4.5-6.5 µm. Brown rot of 9 in NB.

8. Capitately incrusted cystidia present

*Poria sericeomollis* (Rom.) Egeland. Basidiospores oblong to cylindric-ellipsoid, 4-5 x 2.2.5 µm; taste bitter. Brown cubical rot of 2 in BC, MT; 3 in BC; 6 in NB; 7 in BC.

8. Capitately incrusted cystidia not present

*Poria rivulosa* (Berk. et Curt.) Cke. Fusoid cystidioles present; basidiospores ovoid to subglobose, 4.5-6 x 3.5-5 µm. White laminated rot of 3 in BC; 7 in BC.

9. Basidiospores amyloid in Melzer's reagent, oblong to ovoid, 3-5 x 2.5-3.5 µm

*Poria myceliosa* Pk. Pores angular, 1-4 per mm. White rot of 5 in CO; 7 in BC.

9. Basidiospores negative in Melzer's reagent, ovoid to subglobose, 2.5-3.5 x 2-2.5 µm

*Poria mollusca* (Pers. ex Fr.) Cke. Pores circular to daedaloid, usually 4-7 per mm. White rot of 7 in BC.

10. Basidiospores allantoid, 1-1.5 µm wide . . . . . . . . . . 11
10. Basidiospores straight, 2-3 µm wide . . . . . . . . . . . 12
11. Cystidia lacking

*Poria subvermispora* Pilát. Pore surface white to cream colored; pores 2-4 per mm; tubes drying brittle; taste bitter. Brown rot of 2 in CO.

11. Capitately incrusted cystidia present in hymenium

*Poria simani* (Pilát) Gilbn. et Lowe. Pore surface cream colored; tubes drying soft and fragile; cystidia cylindric, 3-4 µm in diam. Brown rot of 9 in AZ.

12. Basidiospores 7-11 x 2-3 µm

*Poria mappa* Overh. et Lowe. Basidiocarps often less than 1 mm thick; pore surface cream colored; pores 3-4 per mm. White rot of 4 in AK.

12. Basidiospores 4-6 x 2-2.5 µm

*Poria monticola* Murr. Basidiocarps up to 3 mm thick; pore surface cream colored to buff; pores 2-4 per mm. Brown cubical rot of 2 in CO, ID; 7 in BC, OR.

13. Pore surface pinkish brown, rose colored or dark purplish . . . 14
13. Pore surface white to cream colored . . . . . . . . . . . . . 18
14. Basidiocarps thin, soft; basidiospores narrowly allantoid or cylindric-ellipsoid . . . . . . . . . . . . . . . . . . . . 15
14. Basidiocarps thin to thick; basidiospores ovoid to subglobose . . . . . . . . . . . . . . . . . . . . . . . . . 16
15. Pore surface rose colored; tube layer not distinctly separated from subiculum; basidiospores cylindric-ellipsoid

*Poria tarda* (Berk.) Cke. Tubes arising as isolated cupules; subicular hyphae thin-walled, 3-6 µm in diam; basidiospores 4-5 x 2-2.5 µm. White rot of 3 in BC.

15. Pore surface becoming purple; tube layer purple, distinctly separated from white, cottony subiculum, basidiospores narrowly allantoid

*Poria taxicola* (Pers. ex Fr.) Bres. Tubes often developing in scattered areas over a white subiculum; hymenium continuous over edges of dissepiments; cylindric cystidioles present; basidiospores 4-6 x 1-1.5 µm. White rot of 2 in CO, ID, WA.

16. Basidiocarps not rhizomorphic, drying horny; pores 4-8 per mm . . . . . . . . . . . . . . . . . . . . . . . . 17
16. Basidiocarps rhizmorphic, drying soft and byssoid; pores 2-3 per mm

*Poria terrestris* (DC ex Fr.) Cke. Pore surface yellow, pinkish or blue; some clamp connections present but most hyphae simple-septate; basidiospores 4-5 x 3-4 µm. Undetermined rot of 2 in AZ; 3 in AT; 9 in AT.

17. Basidiocarps white, drying pinkish; basidiospores 5-6 x 4-5 µm

*Poria vitrea* (Pers. ex Fr.) Cke. Basidiocarps annual; basidia 12-17 x 5-7 µm; basidiospores 5-6 x 4-5 µm. White pocket rot of 9.

17. Basidiocarps pinkish, drying pale brown to dark blackish brown; basidiospores 4-5.5 x 3-4 µm

*Poria nigrescens* Bres. Basidiocarps perennial; basidia 17-20 x 10-12 µm; basidiospores 3.5-5 x 3.5-5 µm. White stringy rot of 7 in BC.

18. Incrusted cystidia present; basidiospores broadly ellipsoid to ovoid . . . . . . . . . . . . . . . . . . . . . . . . 19
18. Cystidia lacking; basidiospores allantoid

*Poria reticulata* (Pers. et Fr.) Cke. Basidiocarps thin, annual, usually effused in small patches; hymenial surface cupulate at first; basidiospores 7-9.5 x 2-3.5 µm. White rot of 2 in CO; 7 in WA.

19. Basidiospores ovoid to broadly ellipsoid, 5-9 x 3-4 µm

*Poria corticola* (Fr.) Cke. Pores 1-3 per mm; subicular hyphae thin- to thick-walled, 2-5 µm in diam. White rot of 8 in CH.

19. Basidiospores ovoid to broadly ellipsoid, 4-5 x 2.5-3 µm

*Poria similis* Bres. Pores 4-6 per mm; subicular hyphae thin- to thick-walled, 2-4 µm in diam. White rot of 7 in BC.

20. Thick-walled, incrusted skeletocystidia present . . . . 21
20. Cystidia absent, cystidioles present in some species . . 24
21. Basidiospores ellipsoid to subglobose . . . . . . . . . . . 22
21. Basidiospores cylindric . . . . . . . . . . . . . . . . . . 23
22. Basidiocarps rhizomorphic; pores 2-5 per mm

*Poria radula* (Pers. ex Fr.) Cke. Pore surface cream colored to pale buff; generative hyphae with clamps; basidiospores 3.5-4 x 2-3 µm. White rot of 6 in ME.

22. Basidiocarps not rhizomorphic; pores 6-8 per mm

*Poria eupora* (Karst.) Cke. Pore surface pinkish buff to vinaceous; generative hyphae with clamps; basidiospores 4-4.5 x 2-2.5 µm. White rot of 6 in NY.

23. Pore surface cream colored

*Poria luteoalba* (Karst.) Sacc. Subiculum cream colored to pale buff; generative hyphae with clamps; basidiospores cylindric, straight or slightly curved, 4-6 x 1.5-2 µm. White pitted and laminated rot of 6 in NH; 9 in QB.

23. Pore surface brownish pink

*Poria rixosa* (Karst.) Karst. Subiculum pinkish buff; generative hyphae with clamps; basidiospores allantoid, 4-6 x 1.5-2 µm. White laminated rot of 2 in MT; 3 in BC, OT, SD; 4 in MN; 6 in NH, NY; 9 in NY.

24. Basidiospores subglobose to ellipsoid . . . . . . . . . . 25
24. Basidiospores oblong to cylindric, straight or allantoid . . . . . . . . . . . . . . . . . . . . . . . 26
25. Basidiocarps perennial, tough-fibrous, pore surface yellowish

*Poria subacida* (Pk.) Sacc. Hyphal system trimitic; tramal and subicular tissue dextrinoid in Melzer's reagent; generative hyphae with clamps, slender binding hyphae abundant, 1-2 µm in diam; basidiospores 4.5-6.5 x 3-4.5 µm; cream colored to golden yellow mycelial felts present in decayed wood. White stringy rot of 2 in ID, MT, OR, WA; 3 in BC, ME, NB, OT; 4 in MB, NF, NS, OT; 6 in CT, ME, NB, NH, NS, NY, VT; 7 in AK, BC, OR, WA; 9 in AK, NS.

25. Basidiocarps annual, tubes and subiculum soft; pore surface white to cream colored

*Poria vaillantii* (DC. ex Fr.) Cke. Margin often with white rhizomorphs; hyphal system dimitic; generative hyphae with clamps; basidiospores 5-8 x 3-4 µm. Brown cubical rot of 7 in WA.

26. Basidiospores cylindric, straight or allantoid . . . . . 27
26. Basidiospores oblong, 3.5-4 x 2-2.5 µm

*Poria romellii* Donk. Basidiocarps annual; pore surface cream colored to pale buff, the pores 6-8 per mm; hyphal system dimitic, generative hyphae with clamps; hyphal pegs present. White rot of 2 in CO; 3 in NWT; 9 in AT.

27. Subiculum uniform in color . . . . . . . . . . . . . . . . . 28
27. Subiculum cream colored to buff with a dark brown layer next to the substratum

*Poria albobrunnea* (Rom.) Baxt. Pore surface white to cream colored, becoming reddish brown on age or drying; hyphal system dimitic; generative hyphae with clamps; basidiospores allantoid, 5-7 x 1.5-2 µm. Brown cubical rot of 3 in AK, YT; 7 in OR.

28. Pore surface bright yellow, sometimes fading on age or drying . . . . . . . . . . . . . . . . . . . . . . . . . . . 29
28. Pore surface white to cream colored or buff, never bright yellow . . . . . . . . . . . . . . . . . . . . . . . . 30

29. Basidiocarps perennial; pores about 1-5 per mm

*Poria alpina* Litsch. Subiculum chalky when dry, up to 2 mm thick tube layer up to 1.5 cm thick. Brown cubical rot of 2 in MT; 3 in AT.

29. Basidiocarps annual; pores 5-7 per mm.

*Poria xantha* (Fr.) Cke. Subiculum chalky when dry, up to 3 mm thick; tube layer up to 3 mm thick. Brown cubical rot of 2 in MT; 3 in AK, AT, BC, NF, NWT, YT; 4 in AK, NWT; 6 in ME; 7 in BC; 9 in AT, BC.

30. Basidiospores cylindric, straight or allantoid; basidiocarps firm . . . . . . . . . . . . . . . . . . . . . . 31
30. Basidiospores lunate; basidiocarps soft, byssoid

*Poria lenis* (Karst.) Sacc. Basidiocarps annual, pores often sinuous in age, 4-7 per mm; basidiospores 3.5-4.5 x 1-1.5 µm. White rot of 2 in ID, MT; 3 in AK; 7 in AK, CA, OR; 9 in MN.

31. Hyphae at dissepiment edges incrusted . . . . . . . . . . . . 32
31. Hyphae at dissepiment edges not incrusted . . . . . . . . . . 33

32. Basidiocarps perennial, becoming thick

*Poria stellae* Pilát. Pores 5-7 per mm; margin fimbriate; fusoid cystidioles present; basidiospores allantoid, 4.5-6 x 0.7-1 µm. White rot of 2 in CO, MT; 4 in NF; 9 in AT, BC.

32. Basidiocarps annual, thin

*Poria subincarnata* (Pk.) Murr. Pore surface creamy white with pinkish cast when fresh; margin fimbriate or sometimes rhizomorphic; fusoid cystidioles present; basidiospores allantoid, 4-6.5 x 1-1.5 µm. White rot of 2 in AT, AZ; 3 in AK, AT, BC; 4 in AT; 7 in BC; 9 in AT, NS.

33. Pore surface cream colored to buff . . . . . . . . . . . . . 34
33. Pore surface becoming cinereous

*Poria cinerascens* (Bres.) Sacc. et Syd. Basidiocarps annual, tough-fibrous; hyphal system trimitic; hyphal pegs present; basidiospores cylindric, slightly curved, 5-7 x 1.5-2 µm. White rot of 2 in AT, AZ, MT, OR; 3 in AK; 6 in CT, ME, NH, NY; 7 in AK; 9 in AT, MN, NS.

34. Basidiospores straight or narrowly allantoid . . . . . . 35
34. Basidiospores broadly allantoid

*Poria crustulina* Bres. Basidiocarps annual; pores angular, 3-4 per mm; hyphal pegs present; basidiospores 7-8 x 2.5-3 µm. White rot of 2 in AZ, BC, CO, ID, MT, WA, WY; 3 in AK, AT, BC, NWT, YT; 4 in AK, NF, NS; 6 in NS; 7 in AK, MT, WA; 9 in NS, BEI.

35. Pores 2-3 per mm . . . . . . . . . . . . . . . . . . . . . . . 36
35. Pores 4-6 per mm . . . . . . . . . . . . . . . . . . . . . . . 37
    36. Basidiospores 4-5.5 x 1.5-2 µm, allantoid

*Poria sinuosa* (Fr.) Cke. Basidiocarps annual; pores 2-4 per mm. Brown cubical rot of 2 in AZ, CO, MT; 3 in AK, BC; 4 in NS.

    36. Basidiospores 5-5.5 x 2-2.5 µ, short-cylindric to oblong, straight

*Poria carbonica* Overh. Basidiocarps annual, tough-corky; pores 3-5 per mm; tube layer up to 1 cm thick; hyphal system trimitic; skeletal hyphae amyloid in Melzer's reagent. Brown cubical rot of 2 in AZ, ID; 7 in BC.

37. Basidiospores cylindric to oblong . . . . . . . . . . . . 38
37. Basidiospores narrowly allantoid

*Poria odora* (Pk.) Sacc. Basidiocarps annual, drying cartilaginous; strong garlic like odor from fresh basidiocarps and rot; pores 4-6 per mm; fusoid cystidioles present; basidiospores 5-6.5 x 1-1.5 µm. Brown rot of 3 in AK, YT.

    38. Basidiocarps chalky; margin not distinctive

*Poria oleagina* Overh. Basidiocarps perennial; becoming crumbly, chalky; pores 4-6 per mm; fusoid cystidioles present; basidiospores short cylindric to oblong, 3.5-5 x 1.5-2 µm. Brown cubical rot of 4 in MN; 7 in BC; 9 in MN.

    38. Basidiocarps cheesy; margin often reddish and resinous

*Poria sitchensis* Baxt. Basidiocarps annual; with strong sweet odor when fresh; pores 4-7 per mm; taste resinously bitter; tramal hyphae weakly amyloid in Melzer's reagent; fusoid cystidioles present; basidiospores 4-5 x 1.5-2 µm. Brown cubical rot of 2 in MT; 4 in AT; 7 in AK, CA, OR.

## Key to species of *Tyromyces*

1. Hyphal system of context or trama dimitic or trimitic; associated with white rot . . . . . . . . . . . . . . . . . . . . . . . 2
1. Hyphal system monomitic; associated with brown rot . . . . . . 4
    2. Skeletal hyphae present in trama; context monomitic . . . 3
    2. Skeletal hyphae present in context

*Tyromyces semipileatus* (Pk.) Murr. Basidiocarps resupinate, effused-reflexed, or sessile; upper surface white or cinereous when fresh, drying grayish to yellowish; pore surface white to cream colored, glancing; pores 8-10 per mm; basidiospores allantoid, 3-4 x 0.5-1 µm. White rot on 9 in OT.

3. Basidiospores allantoid; usually on hardwoods, rarely on conifers

*Tyromyces albellus* (Pk.) Bond. et Sing. Basidiocarps sessile or effused-reflexed; upper surface white, becoming yellowish to light gray, pellicular; pore surface white to pale buff, glancing; pores 6-7 per mm; basidiospores allantoid, 4-6 x 1.5-2.5 µm. White rot of 4 in NB.

3. Basidiospores broadly ovoid to subglobose; known only on conifers

*Tyromyces canadensis* (Overh.) Lowe. Basidiocarps usually sessile; upper surface white to mousy gray; pore surface white to light buff; pores 6-9 per mm; basidiospores 2.5-3.5 x 2-2.5 µm. White rot of 3 in MN.

4. Hyphae with clamp connections . . . . . . . . . . . . . . . 5
4. Hyphae simple-septate

*Tyromyces mollis* (Pers. ex Fr.) Kotl. et Pouz. Basidiocarps sessile, effused-reflexed or resupinate; upper surface pale purplish brown, glabrous, becoming rugose; pore surface pale pinkish brown, basidiospores allantoid, 4.5-5.5 x 1- 1.5 µm. Brown rot of 2 in AZ; 3 in AT.

5. Basidiospores negative in Melzer's reagent . . . . . . . . . . 6
5. Basidiospores dextrinoid in Melzer's reagent

*Tyromyces kravtzevianus* Bond. et Parm. in Parm. Basidiocarps narrowly reflexed or often resupinate; upper surface whitish, becoming blotched with reddish brown on drying; basidiospores ellipsoid to short-cylindric, 5-6 x 2.5-3 µm. Brown rot of 4 in QB; 3 in SK; 9 in NB.

6. Cystidia lacking . . . . . . . . . . . . . . . . . . . . . 7
6. Fusoid cystidia present in hymenium

*Tyromyces balsameus* (Pk.) Murr. Basidiocarps sessile or effused-reflexed, solitary or imbricate, dimidiate or laterally fused and elongated; upper surface whitish to pale brownish, faintly zonate; pore surface whitish, becoming pale brownish on drying; cystidia numerous, often incrusted; basidiospores ovoid to ellipsoid, 3.5-4.5 x 2.5-3 µm. Brown rot of 2 in CO, ID; 3 in AT, BC, NB, OT; 4 in OT; 7 in AK, BC, WA; 9 in NS.

7. Basidiocarps white to rufescent, not with blue tints . . . . . 8
7. Basidiocarps whitish with a blue or grayish blue cast

*Tyromyces caesius* (Schrad. ex Fr.) Murr. Basidiocarps sessile or effused-reflexed, solitary, dimidiate or narrow and shelf-like; basidiospores cylindric to allantoid, 4.5-6 x 1-1.5 µm. Brown rot of 2 in AZ; 3 in AT, BC, CA, NWT, YT; 4 in AK; 6 in CT, ME, NH, NY; 7 in AK, CA; 9 in CA.

8. Basidiocarps without shallow, circular depressions on upper surface . . . . . . . . . . . . . . . . . . . . . . . . 9
8. Basidiocarps with shallow, circular depressions on upper surface

*Tyromyces guttulatus* (Pk.) Murr. Basidiocarps sessile to substipitate, dimidiate to flabelliform, applanate; upper surface white to pale buff; pore surface white to cream colored; tissues with a bitter taste; hyphae thin- to thick-walled, all with clamps; some thin-walled gloeoplerous hyphae with occasional distorted clamps also present; small fusoid cystidioles present; basidiospores short-cylindric, 4-5 x 2-2.5 µm. Brown rot of 3 in MN; 4 in MN; 7 in BC, WA; 9 in NY, PA, WA.

9. Tissue bitter tasting . . . . . . . . . . . . . . . . . . . . . . . . 10
9. Tissue mild, without a bitter taste . . . . . . . . . . . . . . 11
10. Upper surface of basidiocarps smooth, pellicular, cream colored to mousy gray

*Tyromyces tephroleucus* (Fr.) Donk. Basidiocarps sessile or effused-reflexed, dimidiate or flabelliform; pore surface white, becoming yellowish on drying; basidiospores cylindric to allantoid, 4-5 x 1-2 µm. Brown rot on 2 in AZ.

10. Upper surface of basidiocarps usually rough, white, with small black spots

*Tyromyces immitis* (Pk.) Bond. Basidiocarps sessile or effused-reflexed, dimidiate; basidiospores cylindric-ellipsoid, 3.5-5 x 1.5-2 µm. Brown rot of 2 in ID; 3 in NWT, SK; 9 in AZ, MT, NB, OR.

11. Upper surface tomentose to glabrous . . . . . . . . . . . . . 12
11. Upper surface cottony, growing down over and partially enclosing pore surface

*Tyromyces leucospongia* (Cke. et Harkn.) Bond. et Sing. Basidiocarps effused-reflexed or sessile, dimidiate to elongate; upper surface white to pale buff, with a thick layer of soft, cottony tomentum; pore surface cream colored to pale buff; basidiospores allantoid, 4-5 x 1-1.5 µm. Brown rot of 2 in CO, ID, UT, WY; 9 in CA.

12. Basidiocarps white to cream colored, not discoloring on bruising or drying . . . . . . . . . . . . . . . . . . 13
12. Basidiocarps white to cream-colored, staining reddish brown on bruising or drying

*Tyromyces fragilis* (Fr.) Donk. Basidiocarps sessile or effused-reflexed, dimidiate or elongated; hyphal pegs present; basidiospores allantoid, 4-5 x 1.5-2 µm. Brown rot of 2 in AZ, ID; 4 in MN; 7 in WA; 9 in MN, NY, OR.

13. Basidiocarps with strongly undulate margins on reflexed portions; pores 2-3 per mm

*Tyromyces undosus* (Pk.) Murr. Basidiocarps effused-reflexed or occasionally resupinate; upper surface whitish to pale buff; pore surface cream colored; basidiospores allantoid, 4-7 x 1-1.5 µm. Brown rot on 2 in AZ, MT; 6 in ME, NH, NY; 7 in BC, WA.

13. Basidiocarps with level margin on reflexed portions; pores 5-7 pe mm

*Tyromyces perdelicatus* Murr. Basidiocarps sessile or resupinate, dimidiate; upper surface white to light buff, tomentose; pore surface white to light buff; basidiospores cylindric, straight or slightly curved, 4-5.5 x 1-1.5 µm. Brown rot on 2 in AZ, MT.

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# A NEW NEPHROMA SPECIES FROM SOUTH AMERICA

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## SUMMARY

The new species *Nephroma (Nephromium) microphyllum* Henss. from Argentina is characterized by multiseptate acicular spores, squamuliform isidial lobes, moniliform tomentum hairs occuring on both sides of the thallus, and by a distinct pattern of secondary metabolites including phenarctin, usnic acid and several triterpenoids. The close relationship to *Nephroma kuehnemannii* M. Lamb and *Nephroma chubutense* M. Lamb is discussed. A new locality is given for *N.kuehnemannii,* and the pycnidia of this species are described.

## INTRODUCTION

*Nephroma microphyllum* Henss., a new South American species is closely related to *Nephroma kuehnemannii* M.Lamb (Lamb 1955, 1958) and differs from the latter by the presence of a blue-green phycobiont. We have collected both species in the Parque Nacional Lanin, Argentina. The *N. kuehnemannii* specimen possessed apothecia and pycnidia, which are not mentioned in the original diagnosis (Lamb 1955). Both species are characterized by multiseptate acicular spores, a unique structure within the genus and by distinct rhizines. A third species belonging to this group is *Nephroma chubutense* M. Lamb (Lamb 1955, 1958). This species only is known in sterile condition but is similar in its morphology and chemical properties.

## MATERIAL AND METHODS

Material studied. The abbreviations of herbaria follow the "Index Herbariorum".

*Nephroma chubutense:* Argentina, Chubut, Lago Menêndez, 1950, Lamb 5916 (UPS, isotype). - Chile, Llanquihue, Lago Todos Los Santos, 1974, Redon 03164 (MB, part of collection mentioned in Redon 1974). - *Nephroma kuehnemannii:* Argentina, Chubut, Lago Menéndez, 1941, Kühnemann 5485 (BA, holotype); - Neuquên, Parque Nacional Lanin, Lago Currhue, Arroyo de Escorial, at the border of a lava field on shady trunk of *Nothofagus dombeyi* at a river bank, c. 1000 m.s.m., 1973, Henssen & Vobis 24590c (MB).

Morphology. The freezing microtome sections were mounted in lactophenol/cotton-blue. Measurements of spores and anatomical structures were made from permanent prepared material; measurements of gross morphology on air-dried specimens.

Analysis of secondary metabolites. The lichen compounds were identified by quantitative isolation from thin-layer chromatograms followed by u.v./v.i.s. spectroscopy and electron-impact-mass spectroscopy (Renner & Gerstner 1978). The separation by TLC followed the method of Culberson (1972); used were the solvent systems A,B, and C; the two - directional separation was carried out on HPTCL-plates (5 x 5 cm).

## TAXONOMIC PART

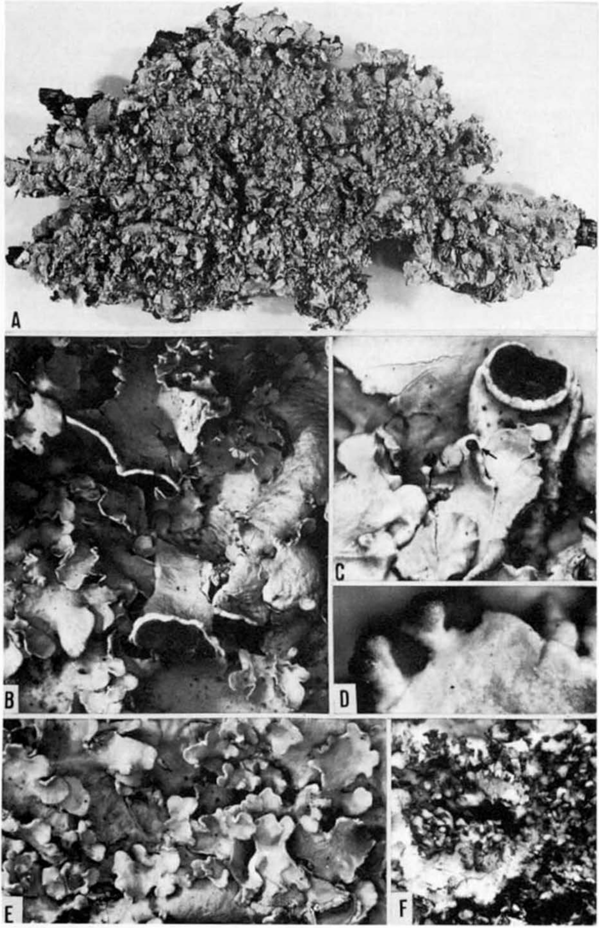
### *Nephroma microphyllum* Henss., sp.nov. Figs.1-3

Diagnosis. Thallus foliosus usque ad 15 cm latus, substrato adnatus, irregulariter laciniato-lobatus, superne griseo-olivaceus, pro parte reticulatus, glaber vel pubescens, inferne pallidus, tomento et rhizinis villoso-vestitus. Lobi 1-2 cm longi et 0.5-1 cm lati, marginibus varie incisis, undulatis, isidio-lobatis. Medulla albida 100 - 300 µm crassa; stratum corticale pseudoparenchymaticum, superne 30-40 µm crassum, inferne 8-15 µm crassum, tomento moniliformi. Apothecia terminalia, mox sese sursum revolventia, rotundata vel oblonga, usque ad 6 mm lata, disco obscure rufo-fusco; margo thallinus irregulariter incisus, cortex areolato-aspero. Hymenium 95-120 µm altum, hypothecium 45-50 µm altum, in iodo cyanescens. Acsi clavati, 5 (-8 ?) sporis, (7-)10-11.5 x 85-90(-105)µm. Sporae 5-8-septatae, incolores, (65-)70-90(-105) x 3-3.5 µm. Pycnidia fusca, marginalia vel submarginalia, mox composita et pedicellata, pro parte ramosa, usque ad 0.35-0,45 mm longa et 0.2 mm lata; conidia bacilliformia, 3-4 x 1 µm. Alga ad *Nostoc* pertinens.

Holotype: Argentina, Prov. Neuquén, Parque Nacional Lanín, Lago Lacar, near forest station Pucara, W of Rio Nothué, on a dead lying trunk of *Nothofagus* at the side of a rivulet in a park-like stand of *Nothofagus* at c. 800 m.s.m., 1973, Henssen & Vobis 24574a (MB); isotype: BA. Paratype: three kilometers from the type-locality on the trunk of *Nothofagus dombeyi* growing beside a canal in a dense *Nothofagus-forest,* at c. 800 m.s.m., 1973, Henssen & Vobis 24572c (MB).

Thallus corticolous, grey-or blue-olive, expanding up to 15 cm or more, adnate to the substrate. Upper surface partly reticulate and/or provided with cracks, naked or with patches of moniliform hairs, occasionally with globular outgrowths of the cortex lower surface pale, covered to a great extent by whitish rhizines and a tomentum of moniliform hairs. Rhizines c. 0.3-1.2 mm and 0.06-0.4 mm broad; tomentum hyphae 20-60 µm long and c. 3.5 µm thick, often branched. Lobes irregularly branched, 1-2 cm long and 0.5-1 cm broad, undulated, incised and covered by flat partly imbricate isidial lobes. Isidial lobes incised of the same color as the thallus upper surface, c. 1 mm broad and gradually enlarging to form lobes.

Thallus sections (without hairs or isidia) 315-400 µm high. Upper cortex 30-40 µm thick, pseudoparenchymatous with an inner hyaline layer composed of anticlinal thin - walled hyphae 3-4 cells high with isodimetric cells and 5-9 µm large lumina, and an outer layer of two cell rows formed by periclinal hyphae with strongly gelatinizing walls and c. 6 µm long lumina; the outer part in older thalli brownish by interspersed lichen substances. Outer cortex cells partly developing into moniliform hairs of the same size and shape as the tomentum hairs of the lower surface, or growing out into globular structures. Algal layer 15-80 µm thick, interrupted by strands of medullary hyphae, *Nostoc* cells in clusters surrounded by distinct mucilage sheaths, round or slightly oblong, 5-8 µm in diam. Medulla white, 100-300 µm thick, composed of horizontally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interwoven c. 3-4 µm thick hyphae, in older parts of the thallus opaque and brownish by the numerous crystals deposited on the walls. Lower cortex c. 8-15 µm thick composed of 3-4 rows of cells arising from periclinal hyphae.

Apothecia sparse, terminal on small lobes, formed on the underside, and then reflexed to face partly upwards, disc round or oblong up to 6 cm diam., dark red-brown, surrounded by an incised thalline margin. Underside of apothecium corticated and areolate-verruculose; cortex a massively developed supporting tissue, 100-150 µm thick, composed of 8-15 or more rows of cells, with increasing gelatinization of the walls in outward direction; cell lumina correspondingly diminished from 12 to 4 µm. Hymenium 95-120 µm high, subhymenial layers 90-100 µm including a 45-50 µm thick hypothecium which stains blue in iodine. Asci clavate, containing 5(-8 ?) spores, 85-90 (-105) x (7-) 10-11.5 µm, outer gelatinous layer of the ascus wall amyloid. Spores colorless, acicular-cylindrical, 5-8-septate, with bluntly pointed ends or one end tapering, (65-) 70-90 (-105) x 3-3.5 µm, packed ± straight and parallel.

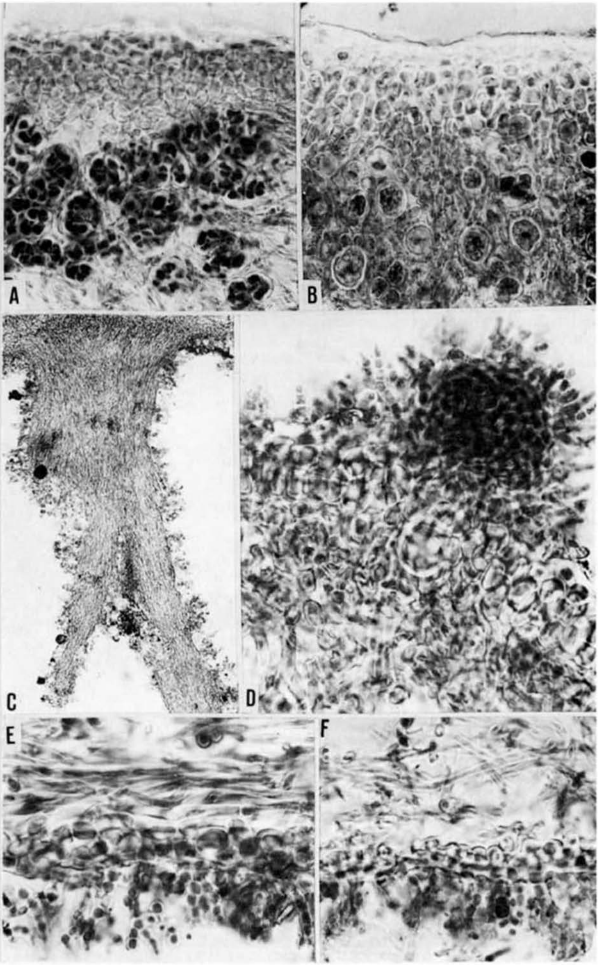
Pycnidia brown, pedicellate and often branched, 0.2 mm broad and finally 0.35-0.45 mm long, with brown tip, composed of basal older and apical younger parts. Conidiophores articulate and branched (*Sticta*-type), conidia rod-shaped, c. 3-4 x 1 µm.

Chemistry: phenarctin, usnic acid, four triterpenoids, four unknown minor constituents.

The name *microphyllum* is chosen since the thallus is covered by small isidial lobuli.

Remarks on morphology. *Nephroma microphyllum* corresponds in some characters with *N.kuehnemannii* and in some with *N.chubutense* (Table 1). In habit *N.microphyllum* resembles *N.chubutense* except for the different color of the upper side

Fig. 1. Habit photographs of *Nephroma* species. A-C, *N.microphyllum* (holotype); A, thallus (x 0.7); B, lobes bearing partly reflexed apothecia (x 4.5); C, young reflexed apothecium and two dark pycnidia (see arrows, x 7.5); D, *N.microphyllum* (paratype), two pedicellate branched pycnidia sitting on the margin of a lobe (x 31). E, *N.microphyllum* (holotype), part of the thallus covered by flat isidial lobes (x 6). F, *N.chubutense* (isotype: UPS), part of the thallus covered by ± brown isidial squamules (x7.5).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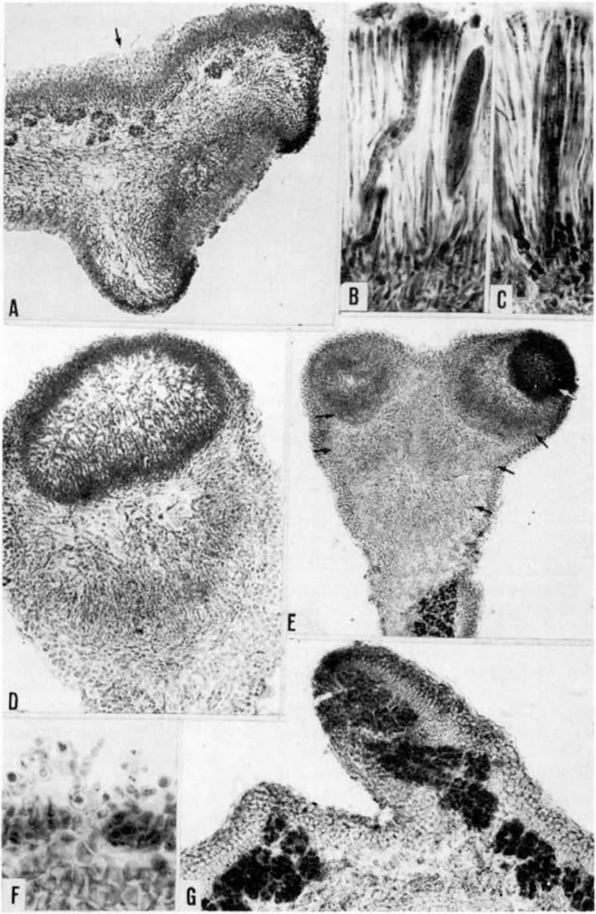
being grey-to blue-olive in *N.microphyllum* and straw-yellow in *N.chubutense*. In both species the thallus is covered by flat isidia or isidial lobes. In *N.microphyllum* the isidial lobes have the same color as the thallus; in *N.chubutense* they are more or less brown.

Table 1. Important taxonomic characters of the *Nephroma kuehnemannii*-species-group

| | *N.kuehnemannii* | *N.microphyllum* | *N.chubutense* |
|---|---|---|---|
| phenarctin | + | + | – |
| spores multicellular-acicular | + | + | ? |
| pycnidia composed and pedicellate | + | + | ? |
| rhizines present | + | + | – |
| squamulose isidial lobes present | – | + | + |
| thallus upperside straw-yellow | + | – | + |
| thallus lower side pale | + | + | – |
| phycobiont *Nostoc* | | | |

In *N.chubutense* the isidia originate as outgrowths of the medullary hyphae as in *Peltigera praetextata* (Somm.) Vain. (Henssen & Jahns 1973), while in *N.microphyllum* they arise from a simultaneous outgrowth of cortex cells and the underlying medullary hyphae (Fig 3 G). The globular

Fig. 2. Anatomy of *Nephroma species* (microtome sections). A, *N.microphyllum* (holotype), upper part of thallus (x 400). B, *N.kuehnemannii* (Henssen 24590c), upper part of thallus (x 400). C-D, *N.microphyllum* (holotype); C, l.s. of rhizine developed from cortical cells (x 100); D, thallus upper cortex bearing a globular structure and moniliform hairs (x630). E, *N.microphyllum* (paratype), thallus lower cortex with tomentum hairs (x 630). F, *N.kuehnemannii* (Henssen 24590c), thallus lower cortex bearing some moniliform hairs (x 630).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cortical structures of *N.microphyllum* resemble stages of isidial development in *Peltigera lepidophyllum* (Nyl.)Vain. in which *Nostoc* cells lying on the thallus surface have been captured and surrounded by hyphae developing from the cortical cells (Henssen & Jahns 1973). In the globular structures of *Nephroma microphyllum*, however, no algal cells were seen.

In *N.chubutense* isidial lobes are developed abundantly laminally and marginally while in *N.microphyllum* they are formed predominately along the margin of the lobes. The lower surface is pale in *N.kuehnemannii* and *N.microphyllum* although very old thalli of the latter species become darkened, a condition which is normal in *N.chubutense*. Both, *N.kuehnemannii* and *N.microphyllum* produce abundant rhizines which arise mainly from the outer cells of the lower cortex (Fig. 2 C), a pattern similar to *N.resupinatum* (L.) Ach. (Hannemann 1973). Moniliform hairs occur in all three species. In *N.microphyllum* the tomentum is well developed on the lower side and along the rhizines (Fig. 2 C, E) and is recognized easily with a hand-lens. Some patches of hairs occur on the upper surface (Figs. 2 D, 3 F). In *N.kuehnemannii* tomentum hairs are rather rare and mainly restricted to the margin of the rhizines. The lower surface of *N.chubutense* is covered in part by a very dense tomentum of moniliform hairs up to 10 cells high.

The structures of the thallus cortices are similar in the three species. The upper cortices are pseudoparenchymatous, composed of anticlinal thin-walled hyphae with isodiametric cells overlied by some rows of cells with strongly gelatinized walls arising from periclinal hyphae. The

Fig. 3. Anatomy of *Nephroma species* (microtom sections). A-B, *N.microphyllum* (holotype); A, young apothecium (x 100); B, part of hymenium (x470). C, *N.kuehnemannii* (Henssen 24590c), part of hymenium (x470). D-G, *N.microphyllum* (Holotype); D, composed pycnidium (x 200); E, branched pycnidium with several levels of superimposed pycnidial cavities (x 100). F, upper cortex bearing moniliform hairs (x 700); G, developing isidial lobes (x 200).

lower cortex is formed by periclinal hyphae and strengthened by cells added by adjacent medullary hyphae. The cells of the lower cortex are relatively roundish and thick-walled in comparison to some other species-groups within the genus *Nephroma*. Crystals of lichen substances may be deposited in the gelatinous walls of the upper cortex and along the medullary hyphae, thus causing a brownish coloration of the medulla and outer layer of the upper cortex in older parts of the thallus.

Apothecia and pycnidia are unknown in *Nephroma chubutense*. In *N.microphyllum* and *N.kuehnemannii* the shape, structure and development of the apothecia and pycnidia correspond closely. The apothecia are ultimately more or less reflexed and surrounded by an incised thalline margine (Fig. 1 B,C). A thick uneven supporting tissue is formed below the hymenium like in other *Nephroma* species (Keuck 1977). The long multiseptate colorless spores are a characteristic feature.

The development of the pycnidia is of special interest. In later stages they are pedicellate and may be branched. The stalk is formed by a successive vertical growth in which a new pycnidium is formed in the upper part of the preceding older cavity; up to four superimposed levels have been observed in *N.microphyllum* (Fig. 3 D,E) and two in a sectioned pycnidium of *N.kuehnemannii*. A branch arises when two young pycnidia are formed simultaneously in the upper part of the old one (Fig. 3 E).The pycnidia in *N.kuehnemannii* are ca. 270 µm long and 150 µm thick, the conidia measure 3.5-4.5 x 1 µm.

Acicular spores and pedicellate pycnidia with superimposed cavities are not known from other groups of *Nephroma* species. Tomentum hairs occur more or less abundantly in a number of species (cf. Wetmore 1960) and similar isidial lobes are present in the *N.helveticum* -, *N.cellulosum* - and the *N.arcticum*-group.

Remarks on chemistry. The major constituent of *N.microphyllum* is a fully substituted depside. The u.v./v.i.s. spectrum (in methanol) shows maxima at 255 nm, 284 nm, 314 nm, minima at 234 nm, 272 nm, 299 nm and an inflextion at 368 nm. The mass spectrum (at 70eV, 230°C) yields fragments at m/e150, m/e178, m/e207 and m/e210. These physical data agree with those given by Bruun (1971) for phenarctin. Thinlayer chromatography of phenarctin in solvent system C exhibits a strongly fluorescence spot of $R_f$ 0.6. The presence of usnic acid was detected by the use of two-directional TLC. Three further diphenyl-carboxylacidesters could be found in the $R_f$-classes 6 and 7. Due to their low concentration structural elucidation has not yet been possible. The chromatographic separation of the crude lichen extract (in acetone) suggests the presence of four triterpinoids in the $R_f$-classes 5 and 7. Two of them possess hopane-character as is concluded from their mass-spectroscopical fragmentation-pattern.

A similar spectrum of triterpenoids has been found by us in *N.kuehnemannii* and *N.chubutense*. *Nephroma microphyllum* contains one more triterpenoid than *N.kuehnemannii*, and *N.chubutense* differs from the other species by the presence of at least one additional triterpenoid, which most likely is identical with the hopane-triol in *Pseudocyphellaria mougeotiana* (Vain.) Del.var. *dissecta* (Müll.Arg.) H.Magn. (Corbett & Cumming 1971). *Nephroma kuehnemannii* also contains phenarctin, usnic acid and the minor constituents mentioned above for *N.microphyllum*.The secondary metabolites thus far characterized are nearly identical in the two species.

A similarity exists between the secondary metabolites of *N.microphyllum* and *N.kuehnemannii* and that of *N.arcticum*, in which Bruun (1971) demonstrated the existence of phenarctin (and nephroarctin). However *N.arcticum* only contains zeorin as a neutral substance and differs moreover by the absence of usnic acid. Further chemical similarities between *N.microphyllum/N.kuehnemannii* and other species-groups of *Nephroma* do not apparently exist.

Taxonomic relationships. The correlation of numerous morphological and chemical characters indicates a close taxonomic relationship between *N.microphyllum* and *N.kuehnemannii* (Table 1).

According to thallus morphology and the similar pattern of triterpenoids, *N.chubutense* is obviously a third species of this clearly difined group within the genus *Nephroma*. Of interest is the correspondance of chemical and morphological features in *N.kuehnemannii* and *N.microphyllum*, species containing different phycobionts. Possibly they represent morphotypes in the sense of James & Henssen (1976) but at present we have no direct evidence. On the other hand, the occurence of a third species *N.chubutense* may indicate a larger group of closely related species having evolved in the Patagonian Andes.

Distribution and ecology. The three species of the *N.kuehnemannii*-group were collected in the evergreen *Fitzroya*-(Alerce-) and/or *Nothofagus dombeyi*-(Coihue-) forests of the Southern Andes (Hueck 1966, Lamb 1955, Redon 1974). They grow on bark of shady trees in the rain forest or in more open areas near streams, and are associated with species of *Pseudocyphellaria*, *Psoroma* and other lichen genera.

## RESUMEN

La nueva especie *Nephroma (Nephromium) microphyllum* Henss. de Argentina se carateriza por tener esporas multiseptadas aciculares, lóbulos isidiales escuamiformes, un tomento de vellos moniliformes a ambos lados del talo y por sus peculiares substancias liquénicas, entre ellas fenarctina, ácido úsnico y ciertos triterpenoides. Se discute el estrecho parentesco con *Nephroma kuehnemannii* M.Lamb y *Nephroma chubutense* M.Lamb. Se indica una nueve localidad para *N.kuehnemannii* y se describen los picnidos de esta especie.

## ACKNOWLEDGEMENTS

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# A STUDY OF *AMANITA* TYPES
## II. *A. OCREATA* PECK

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The first publication of this series (Jenkins, 1978) described and/or designated type specimens of names in *Amanita* by C. H. Peck. Since then, the type of *A. ocreata*, not included in the above, was located. Herein, this specimen is described and implicitly designated as the holotype. Colors from the original description are italicized.

*Amanita ocreata* Peck. 1909. Torrey Bot. Club Bull. 36: 330.
Holotype (Implicit: *des. mihi*): Claremont, California, i. 1909, C. F. Baker s.n.(NYS).

PILEUS: approximately 6 cm broad, plano-convex, *white*, margin not striate; volva as a very thin, floccose-membranous patch covering most of the pileus surface. LAMELLAE: moderately crowded, broadly sinuate, *white*. STIPE: 8 x 1.2 cm, cylindric, hollow, slightly fibrillose below annulus, becoming glabrous toward base, *white*, base not inflated; annulus superior, thin membranous; volva *white*, 3 cm deep, margin entire and free, membranous, saccate.

PILEIPELLIS: filamentous hyphae densely interwoven to subradial, slightly gelatinized. PILEUS TRAMA: undifferentiated filamentous hyphae up to 8 µm diam; inflated cells oblong elliptic, clavate, to fusiform, up to 95 x 15 µm. LAMELLA TRAMA: bilateral; filamentous hyphae up to 9 µm diam, moderately branched, no clamps; inflated cells oblong elliptic to clavate, terminal or short, terminal chains. SUBHYMENIUM: hyphae inflated ramose to subcellular, no clamps. BASIDIA: up to 55 x 6-14 µm, 4-sterigmate, thin-walled, no clamps. VOLVA: remnants at base of stipe almost exclusively filamentous hyphae, moderately branched, up to 11 µm diam, no clamps, randomly oriented; inflated cells rare, clavate, terminal, up to 140 x 15 µm: volva on pileus same as that at base of stipe. STIPE: filamentous hyphae undifferentiated, moderately abundant, sparsely branched, up to 10 µm diam, no clamps; inflated cells narrowly clavate, terminal, longitudinally oriented, up to 374 x 37.6 µm. PARTIAL VEIL: composed primarily of filamentous hyphae, moderately branched, up to 7 µm diam, randomly interwoven, no clamps; inflated cells numerous, terminal, clavate, up to 30 x 10 µm, occasionally with refractile contents.

SPORES: 9.4-10.9(11.7) x 7.0-8.6 µm ($\underline{E}$ = 1.21-1.46; $\underline{E}^m$ = 1.28), broadly elliptic to elliptic, often adaxially flattened, hyaline, amyloid, thin-walled; contents guttulate; apiculus sublateral, cylindric.

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# A NEW BLUING SPECIES OF PSILOCYBE FROM FLORIDA, U.S.A.

by

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During the II International Mycological Congress at Tampa, Florida, U.S.A., in September 1977, one of the authors (Pollock) collected near Tampa an undescribed bluing species of *Psilocybe*. This interesting novelty is described below. This is the third record of bluing species of *Psilocybe* in Florida. The first was made by Murrill (1941) who described *Stropharia cyanescens* Murr., a synonym of *Psilocybe cubensis* (Earle) Sing. (Singer, 1948) and a very common hallucinogenic fungus throughout Florida. The second record of a bluing species of *Psilocybe* from Florida was made by Guzmán and Thiers (1977) who reported *P. mammillata* (Murr.) Smith, previously known only from Jamaica.

This paper precedes a monograph on the genus *Psilocybe* in preparation by the senior author. He expresses his thanks to the Guggenheim Memorial Foundation at New York for supporting his research. He also expresses his thanks to the directors of the herbaria NY and PC for loan of types. Pollock gratefully acknowledges Dr. R.L. Taylor at the University of Texas Health Science Center at San Antonio for providing laboratory facilities to conduct part of his research. The authors further thank Dr. D.E. Stuntz and Dr. G.A. Escobar, both at the University of Washington in Seattle, for critical review of this paper.

*Psilocybe tampanensis* Guzmán & Pollock, sp. nov. Fig. 1

*Pileo circa 24 mm lato, convexo vel subumbilicato, leve, hygrophano, subviscido, ochraceo-brunneo. Lamellis subadnatis, brunneo-violaceis, marginibus albidis. Stipite circa 50 x 2 mm, rufobrunneo, leve, basi caerulescente;*

*sine annulo. Carne caerulescente, odore et sapore farinaceis. Sporis (7.7-) 8.8-9.9 (-12) x (6-) 7-8.8 (-9.9) x 5.5-6.6 µm, frontaliter subrhomboideis, lateraliter subellipsoideis. Pleurocystidiis nullis. Cheilocystidiis 16-22 x 4-9 µm, copiosis, lageniformibus, hyalinis, collo longis et flexuosis, 2.2-3 µm latis. Subhymenio hyalino, pigmento flavo-brunneo intercelluloso irregulariter deposito. Epicute subgelatinosa. Terricola. Typus: Pollock, Sept. 3, 1977, prope Brandon, Tampa, Florida, U.S.A.* (ENCB).

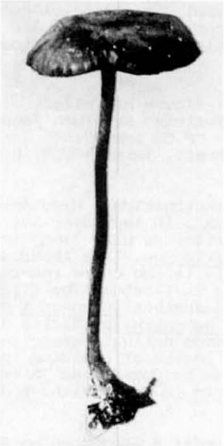

Fig. 1. *Psilocybe tampanensis* Guzmán & Pollock (type), wild carpophore (photo by Pollock).

Pileus about 24 mm broad, convex to slightly umbilicate, smooth, subviscid, hygrophanous, ochraceous brown to straw brown, slightly bluish at the margin. Lamellae subadnate, dark violet brown with whitish edges. Stipe about 50 x 2 mm, fibrous, slightly thickened at the base, smooth but subflocculose at the apex, yellowish brown to reddish brown, with whitish to cesious base. Flesh whitish to yellowish, thin, staining blue when cut. Odor and taste slightly farinaceous. Spore print violaceous purpuraceous brown.

Spores (7.7-) 8.8-9.9 (-12) x (6-) 7-8.8 (-9.9) x 5.5-6.6 µm, subrhombic in face view, subelliptic in side view, brownish yellow (in KOH), with thick smooth wall,a distinct germ pore, and a short appendage. Basidia 14-22 x 8-10 µm, tetrasporic, hyaline, vesiculose or subclaviform. Pleurocystidia absent. Cheilocystidia 16-22 x 4-9 µm, lageniform, with a more or less flexuous long neck 2.2-3 µm in diameter, sometimes irregularly branched, hyaline, abundant, forming a sterile band at the edge of the gill. Subhymenium hyaline, but with yellow brown (in KOH) pigment irregularly incrusted on the walls. Trama regular, light brown to dark yellowish brown, with diffuse pigment; hyphae 10 µm in diameter. Epicutis subgelatinized, consisting of parallel, thin (about 2 µm wide), hyaline hyphae. Hypodermium formed by pigmented to hyaline, elongated to subglobose hyphae. Clamp connections present.

Habitat and distribution. Solitary on sandy soil in a meadow. Known only from the type locality.

Material examined. U.S.A., Florida, near Tampa, SE of Brandon, Sept. 3, 1977, Pollock (Type, ENCB).

Cultural observations. Mycelia were obtained from a spore print of the type on 1% malt extract agar and then brought to fruition in San Antonio by casing spawn grown on ryegrass seeds and crimped oats. Procedures for spawn production on these seed media and subsequent methodology leading to fructification were essentially identical to those employed by Pollock (1977). Casing mycelia grown on composted cattle manure also resulted in formation of fruit bodies. Fruit bodies obtained in culture using a fluorescent light source (Pollock 101 and 102, Dec. 1977, ENCB) did not attain full size during their development and usually failed to sporulate. Pileus small (less than 10 mm in diameter); stipe thin (1-2 mm in width), usually very short (less than 35 mm in length) or sometimes elongated (up to 113 mm in length). _P._ _tampanensis_ is strongly heliotropic. Fruit bodies obtained in a fiberglass greenhouse (Pollock 110, March 1977, ENCB) were robust and sporulated copiously. Pileus sometimes reached 38 mm in diameter; stipe thick (often 4-5 mm wide) and reached up to 60 mm in length. Carpophores tend to grow in large clusters on the casing soil. Both browing and bluing are observed. The former tends to predominate unless the latter is accelerated by handling or tissue damage. These same oxidative phenomena occur in sclerotia produced by mycelia in cultivation.

Production of sclerotia in cultivation was observed for _P._ _mexicana_ (Heim & Cailleux, 1957, and Heim et al., 1958). Guzmán (1978) reported sclerotia in wild conditions in _P._ _caerulescens_ and Pollock (1978) has observed their socio-economic importance to the Mazatecs of Oaxaca. It is interesting to note that for _Psilocybe_ sclerotia have been reported in _P._ _mexicana_, _P._ _caerulescens_, and _P._ _tampanensis_.

Discussion. *P. tampanensis* is close to *P. mexicana* Heim and *P. caerulescens* Murr. but differs from the former in the shape of the fruiting body and size of the basidia and from the latter in the size of spores and cheilocystidia. In fact, *P. mexicana* has a mycenoid habit and basidia 22-24 (-32) x 7.7-11 µm; where as *P. caerulescens* has a collybioid habit, spores (6-) 6.7-8 (-8.5) x 5.2-6.5 x 3.3-5.2 µm, and cheilocystidia 15-22 x (3-) 4.4-5.5 µm, according to examination made by the senior author of both types (PC and NY respectively). *P. tampanensis* seems to be a subtropical species intermediate between *P. caerulescens* and *P. mexicana*. *P. caerulescens* occurs from Alabama (U.S.A.) to Venezuela (a new rocord recently made by the senior author), and *P. mexicana* has a distribution from Mexico to Guatemala (recently reported from the latter country by Lowy, 1977). Both fungi are hallucinogenic and are found in meadows or open places of the subtropical forests. Because of its close relationships with the previously mentioned hallucinogenic species, *P. tampanensis* is very probably to contains psilocin and psilocybin. A bioassay by Pollock has established that this fungus is psychoactive in man.

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# STUDIES ON THE LICHEN FAMILY THELOTREMATACEAE. 4*

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## Abstract

Ten new species in the lichen family Thelotremataceae are described: *Ocellularia diacida* Hale, *O. karnatakensis* Hale, *O. minuta* Hale, *O. patwardhanii* Hale, *Phaeotrema psoromicum* Hale, *P. scabridum* Hale, *Thelotrema exile* Hale, *T. planarium* Hale, *Leptotrema africanum* Hale, and *L. mammiculum* Hale. The new combination *Ocellularia astroidea* (Berk. & Broome) Hale is proposed, and *Phaeotrema aggregatum* Hale, *Thelotrema dislaceratum* Kremph., and *T. papillosum* Hale are discussed.

## 1. OCELLULARIA ASTROIDEA (Berk. & Broome) Hale, comb. nov. Fig. 1

*Platygrapha astroidea* Berk. & Broome, Journ. Linn. Soc. 14:109. 1875. Type collection: Ceylon. *Thwaites* 629 (K).

Specimens examined. Sri Lanka. Sabaragamuwa Prov.: Sinharaja Forest Reserve near Weddagala, *Hale* 47127 (US); Gilimale Forest Reserve, *Hale* 46297, 46365 (US). Southern Prov.: Moravaka Hill near Deniyaya, *Hale* 47037 (US).

This species was originally described as a fungus and even transferred to the genus *Cryptodiscus*. It is, however, lichenized, a member of the *Ocellularia alborosella* complex, and characterized by a broad, thin, lightly pruinose disk (0.7-1.5 mm wide), a delicate, recurved thalline margin with or without a persistent inner exciple, and the dark hypophloeodal thallus. The spores are small (3-4 X 10-15 µm) and I negative. There are no chemical substances present. The species is known only from lowland rainforest in Sri Lanka where it typically occurs on the lower trunk.

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*All chemical tests were done with thin-layer chromatography in two solvent systems. I would like to acknowledge the logistical support of the Maharashtra Association for the Cultivation of Science, Poona, in India and the Flora of Ceylon Project in Sri Lanka. Contribution No. 3 in this series was published in *Mycotaxon* 3: 173-181. 1975.

## 2. OCELLULARIA DIACIDA Hale, sp. nov. Fig. 2

Thallus corticola, epiphloeodes, planus vel verruculosus, aetate rimosus, pallide castaneus, 6-10 cm latus; apothecia numerosa, semi-emergentia vel vix emergentia, 0.4-0.6 mm diametro, apice fuliginea, columellata, columella 50-75 µm diametro, excipulo proprio connato; hymenium 90-100 µm altum; sporae 8:nae, incolores, transversim 6-8 loculatae, 4-8 X 16-25 µm, I+ caerulescentes.

Chemistry: Two unknown substances ($H_2SO_4$ + brown) forming a double spot above norstictic acid in Culberson's solvents A and B along with possible traces of norstictic acid.

Holotype: Evergreen forest, Devimane Ghat on Kumtha-Sirsi road, Karnataka, India, elev. about 100 m, M. E. Hale 47933 (US; isotype in AMH).

Additional specimens examined. India. Karnataka: Hebri-Udipi road, *Hale* 47893 (US); Ballur, Sagar-Anandpur road, *Hale* 47872, 48085 (US); Kumtha, *Patwardhan & Kulkarni* 77.132 (AMH, US).

This species externally resembles *O. perforata* (Lgt.) Müll. Arg. but can be distinguished by the more emergent, verruculose apothecia and unique chemistry. It is apparently endemic to the evergreen monsoon forests in the Western Ghats region at lower elevations.

## 3. OCELLULARIA KARNATAKENSIS Hale, sp. nov. Fig. 3

Thallus corticola, epiphloeodes, crassus, opacus, bullatus vel crasse isidiatus, isidiis solidis, usque ad 0.5 mm diametro, apice nitidis, albidis, pallide castaneus, ad 12 cm latus. Apothecia immersa, 0.4-0.7 mm diametro, columellata, columella ca. 150 µm diametro; ostiolum parvum, rotundatum, 0.1 mm latum, albo-pruinoso-annulatum; hymenium ca. 280 µm altum; sporae 2-4:nae, incolores, transversim 12-16 loculatae, 10-12 X 90-150 µm, I+ caerulescentes.

Chemistry: "Chonestoma" series (K-, P-).

Holotype: Liana in evergreen forest, 5 km SE of Yellapur, Karnataka, India, elev. about 600 m, M. E. Hale 46205, 25 Feb. 1977 (US; isotype in AMH).

Additional specimens examined. India. Karnataka: Devimane Ghat, *Hale* 47860 (US); Agumbe-Koppa road, *Hale* 47870 (US); Yellapur to Karwar, 2-10 km east of Yellapur, *Hale* 48020 (US).

The "chonestoma" series includes a spot from the *Ocellularia olivacea* series (see Hale, 1974:24) and a higher one, reacting yellowish rather than gray with $H_2SO_4$, which is absent in *O. olivacea*. It is found in *O. groenhartii* Hale, also known from India, another large-spored species with semi-emergent apothecia. *Ocellularia karnatakensis* is distinguished morphologically by the flush or immersed apothecia and the often conspicuously developed "isidia," which are exceptionally coarse and perhaps better defined as cylindrical verrucae. The species is typical of the evergreen monsoon forest at the edge of the Western Ghats at 600-800 m elevation, occurring on lower trunks and lianas.

4. OCELLULARIA MINUTA Hale, sp. nov. Fig. 4

Thallus corticola, epiphloeodes, crassus, nitidus, planus, aetate rimosus, pallide viridi-albus, usque ad 10 cm latus; apothecia numerosa, dispersa, immersa, ca. 0.2 mm diametro, intus pallida, columella nulla atque excipulo proprio evanescenti; hymenium ca. 90 µm altum; sporae 8:nae, male evolutae, incolores, 4 X 15 µm, transversim 5-6 loculatae, I+ caeruleae.

Chemistry: Fumarprotocetraric acid.

Holotype: Virgin rain forest along trail over Moravaka Hill southwest of Deniyaya, Matara District, Southern Province, Sri Lanka, elevation about 200 m, M. E. Hale 47033 (US; isotypes in BM, PDA).

Additional specimen examined. Sarawak: Mt. Matang, *Hale* 30768 (US).

This species differs from others with flush, immersed apothecia (e.g. *O. alba* (Fée) Müll. Arg.) in having very small pores. The chemistry is unique, no other species in the genus being known with fumarprotocetraric acid. It is a canopy species in lowland dipterocarp forests.

5. OCELLULARIA PATWARDHANII Hale, sp. nov. Fig. 5

Thallus corticola, epiphloeodes, nitidus, continuus sed valde verruculosus, pallide castaneo-albidus, 5-7 cm latus. Apothecia numerosa, emergentia, 0.8-1.2 mm diametro, amphithecio verrucoso, columella nulla, excipulo proprio non persistenti; ostiolum rotundatum minutumque, plus minusve depressum, 0.05-0.1 mm diametro; hymenium ca. 250 µm altum; sporae 1-2:nae, incolores (vel aetate fuscescentes), transversim 20-30 loculatae, 21-25 X 150-210 µm, I+ caerulescentes.

Chemistry: Norstictic acid.

Holotype: Near Agumbe, Karnataka, India, elev. about 600 m, P. G. Patwardhan 77.426, 28 Feb. 1977 (AMH; isotype in US).

Additional specimen examined. India. Karanataka: Evergreen forest, Agumbe-Koppa road, *Hale* 47961 (US).

The diagnostic feature of this Indian endemic is the presence of norstictic acid, a very rare acid in the genus (known so far only in an undescribed species from New Zealand). The apothecia are semiemergent but barely distinguishable from the thalloid verrucae except for the small pore. The *Hale* 47961 collection, which has brownish spores, is senile and covered with epiphytic algae. Darkening of similarly large spores is also known in *O. fecunda* (Vainio) Hale (see Hale, 1974:20). This is another species peculiar to the evergreen monsoon forest of the Western Ghats. It is named in honor of Dr. P. G. Patwardhan, lichenologist at the Maharashtra Association for the Cultivation of Science.

6. PHAEOTREMA AGGREGATUM Hale

Smithsonian Contr. Bot. 16:29. 1974. Type collection: Dominica, *Hale* 35229 (US, holotype).

Additional specimens examined. Sri Lanka. Western Province: Morapitiya logging area, *Hale* 51021 (US); South of island: *Thwaites* C.L. 167 (BM, S, UPS). Dominica: Dom-Can logging area at Dleau Gommier, elev. 1600-1700 ft., *Hale* 35177 (US).

This species is now represented by a second collection from Dominica, which had previously been misidentified as a *Phaeographis*. It is also known, rather unexpectedly, from Sri Lanka from a Thwaites collection made in the 1860's and identified by Leighton (1869) as *Thelotrema auberianum*. I recollected it on tree tops in dipterocarp forest. It has clustered chroodiscoid apothecia and a thin, waxy, often olivaceous thallus.

7. PHAEOTREMA PSOROMICUM Hale, sp. nov. Fig. 6

Thallus corticola, epiphloeodes, nitidus, minute verrucosus, sparsissime isidiato-bullatus, pallide brunneo-albus (in herbario), 5-8 cm latus; apothecia numerosa, immersa vel semi-emergentia, 0.3-0.6 mm diametro, apice fuliginea, columella nulla, excipulo proprio non distincto; ostiolum rotundatum, ca. 0.1 mm diametro; hymenium ca. 120 µm altum; sporae 8:nae, fuscae, 8-10 X 20-24 µm, transversim 5-6 loculatae.

Chemistry: Psoromic acid.

Holotype: On tree, Mt. Gegerbentang, West Java, elev. 1800 m, P. Groenhart 2200 (L; isotype in US).

This ecolumellate species has apothecial structure similar to the ecolumellate populations of *Ocellularia papillata* (Lgt.) Zahlbr. (see Hale, 1974:24). Other psoromic acid-containing species of *Phaeotrema* have either much larger emergent apothecia or a columella.

8. PHAEOTREMA SCABRIDUM Hale, sp. nov. Fig. 7

Thallus humicola vel muscicola, fragilis, opacus, minute scabridus, albus, 8-12 cm latus; apothecia semi-emergentia vel fere erecta, aggregata, cum thallo concolora, 0.3-0.5 mm diametro, intus pallida, columella nulla, excipulo proprio non distincto; ostiolum nigrum, rotundatum, 0.05-0.1 mm diametro; hymenium 65-75 µm altum; sporae 8:nae, fuscae, 6 X 12-14 µm, transversim 3-4 loculatae.

Chemistry: Psoromic and norpsoromic acids.

Holotype: On humus in open forest on Tourist Trail between Layang Layang and Paka Cave, Kinabalu National Park, Sabah, elev. 2700-2900 m, M. E. Hale 28055, August 1964 (US).

Additional specimen examined. Sabah: Layang Layang, Kinabalu National Park, *Hale* 28346 (US).

This species is distinguished by the white, scabrid thallus and the unusual habitat, exposed detritus and humus or tree bases. It has no close relatives in the genus.

### 9. THELOTREMA DISLACERATUM Kremph. Fig. 8

Giorn. Bot. Ital. 7:17. 1875. Type collection: Sarawak, *Beccari* 208 (M, lectotype).

This species was first published without spore information as *Thelotrema* (?) *dislaceratum*. I re-examined the type and was able to find colorless, muriform spores about 10 X 20 µm in size. It is, therefore, correctly placed in *Thelotrema*. The disc is open, 0.5-0.8 mm wide, irregular in outline, and slightly pruinose. The coarse thalline margin is carbonized and erect, almost chroodiscoid but lacking any trace of a proper exciple. Psoromic and norpsoromic acid are present. The only other psoromic acid-containing species in *Thelotrema* with an open disc is *T. wrightii* Tuck., which has a coarse noncarbonized rim and spores about 6 X 12 µm (see Hale, 1978:48).

### 10. THELOTREMA EXILE Hale, sp. nov. Fig. 9

Thallus corticola et muscicola, epiphloeodes, fragilis, nitidus, crasse verruculosus, cremeo-albidus, 10 cm latus; apothecia emergentia, amphithecio verruculoso, 0.7-1.0 mm diametro, intus pallida, excipulo proprio connato; ostiolum rotundatum, depressum, 0.1 mm diametro; hymenium pallidum, ca. 300 µm altum; sporae 1:nae, 40-50 X 200-225 µm, dense murales, I+ caeruleae.

Chemistry: Psoromic acid.

Holotype: Small ridge just above E. Mesilau River, Kinabalu National Park, Sabah, elev. 1900 m, M. E. Hale 28249, Aug. 1964 (US).

The closest relative is *T. endoxanthum* Müll. Arg. from Australia, which also has psoromic acid and large spores but differs in having a nonbullate, thicker thallus. The thallus of *T. exile* is thin and fragile. Apothecia are barely distinguishable from the coarsely verrucose thallus.

### 11. THELOTREMA PAPILLOSUM Hale

Smithsonian Contr. Bot. 16:36. 1974. Type collection: Dominica, *Hale* 38124 (US).

This species, previously known only from Dominica, has been collected a second time by Oberwinkler and Poelt on the mountain El Avila north of Caracas. It is an inconspicuous species with the apothecia nearly lost among the irregular, erupting masses.

Specimen examined. Venezuela. Distrito Federal: El Avila, elev. 2000-2200 m, *Oberwinkler and Poelt* s.n. (M, US).

### 12. THELOTREMA PLANARIUM Hale, sp. nov. Fig. 10

Thallus corticola, epiphloeodes, nitidus, laevis, aetate fissus, cinereo-albus, 5-7 cm latus. Apothecia numerosa, immersa vel vix emergentia, 0.4-0.8 mm diametro, columellata, columella ca. 90 µm diametro, raro deficienti; ostiolum rotundatum, albo-annulatum, 0.1-0.18 mm diametro; hymenium 100-120 µm altum; sporae 8:nae, incolores, 0-1 X 5-6 loculatae, 9-10 X 15-20 µm, I+ caerulescentes.

Chemistry: Psoromic and norpsoromic acids.

Holotype: Gudampara, Cardamom Hills, Kerala, India, elev. 1100 m M. E. Hale 46427, 25 Jan. 1976 (US; isotype in AMH).

Additional specimen examined. India. Kerala: Kumili-Devicolam road, *Hale* 46548 (US).

The psoromic acid-containing species of *Thelotrema* form a difficult, intergrading series. *Thelotrema planarium* stands alone in having nearly flush apothecia, a thick thallus, and a central columella. In India it is closest to *T. masonhalei* Patw. & Kulk., which has a small, white-rimmed pore and large spores.

### 13. LEPTOTREMA AFRICANUM Hale, sp. nov. Fig. 11

Thallus corticola, epiphloeodes, verruculosus, opacus scabridusque, pallide viridi-cinereus, 2-4 cm latus; apothecia numerosa, separata, emergentia, aetate basin constricta, urceolata, amphithecio cum thallo concoloro, scabrido, 0.8-1.0 mm diametro, intus pallida, columella nulla, excipulo proprio persistenti, crasso; ostiolum rotundatum, vix annulatum vel albo-cinctum, ca. 0.15 mm diametro, excipulo interiori prominenti; hymenium ca. 300 µm altum; sporae 1:nae, fuscae, 45-60 X 150-170 µm, dense murales, I-.

Chemistry: No substances present.

Holotype: On tree in rain forest, near Forestry House, Amani, Usambara Mtns., Tanga Prov., Tanzania, elev. ca. 900 m, R. Moberg 1464b (UPS; isotype in US).

Additional specimen examined. Same locality as holotype, *Santesson* 23134 (Santesson herbarium, US).

The large, noncarbonized apothecia, annulate pore with the inner free exciple appearing as in inner pore, and the dull scabrid thallus are distinctive features of this *Leptotrema*. It is known only from the type locality.

### 14. LEPTOTREMA MAMMICULUM Hale, sp. nov. Fig. 12

Thallus corticola, epiphloeodes, nitidus, minute verrucosus, pallide castaneus, ca. 5 cm latus; apothecia numerosa, congesta, valde emergentia, aetate basin constricta, urceolata, 0.6-0.8 mm diametro, intus pallida, columella nulla, excipulo proprio connato; ostiolum conspicue annulatum, albo-cinctum, 0.15-0.2 mm diametro; hymenium ca. 150 µm altum; sporae 8:nae, fuscae, 10-12 X 20-24 µm, transversim 3-5 loculatae, longitudinaliter 1-2 loculatae.

Chemistry: Protocetraric acid.

Holotype: Canopy in virgin dipterocarp forest at the TIMEX logging area west of Ipil, base of Mt. Silligain, Zamboanga del Sur Prov., Philippines, elev. about 200 m, M. E. Hale 24797, June 1964 (US).

The crowded urceolate apothecia and conspicuously annulate pore set this species apart from all others in the genus.

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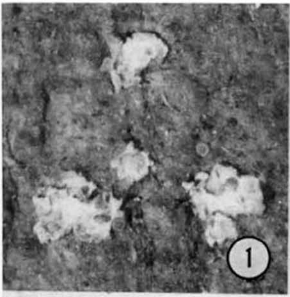
Explanation of figures 1-12:1, *Ocellularia astroidea* (*Hale* 46297); 2, *O. diacida* (*Hale* 47933); 3, *O. karnatakensis* (*Hale* 46205); 4, *O. minuta* (*Hale* 47033); 5, *O. patwardhanii* (*Patwardhan* 77.426); 6, *Phaeotrema psoromicum* (*Groenhart* 2200); 7, *P. scabridum* (*Hale* 28055); 8, *Thelotrema dislaceratum* (*Beccari* 208 in M); 9, *T. exile* (*Hale* 28249); 10, *T. planarium* (*Hale* 46427); 11, *Leptotrema africanum* (*Moberg* 14646); 12, *L. mammiculum* (*Hale* 24797). Scale shown in figs. 6 and 12 is 1 mm.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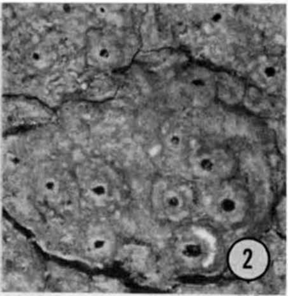
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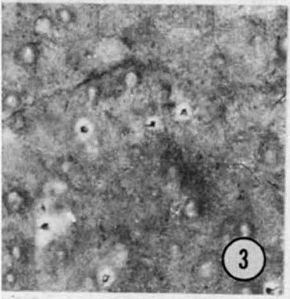
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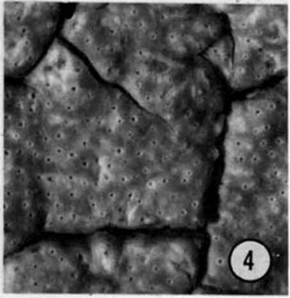
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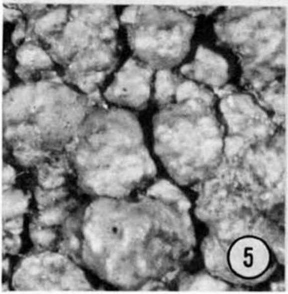
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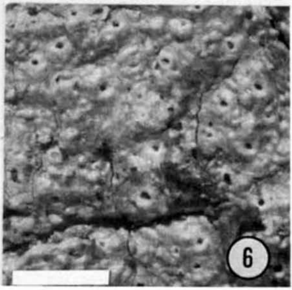
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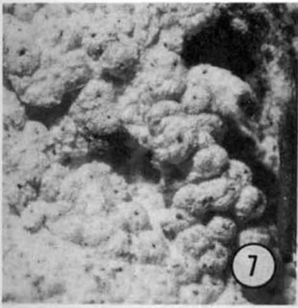
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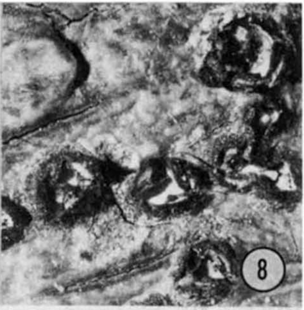
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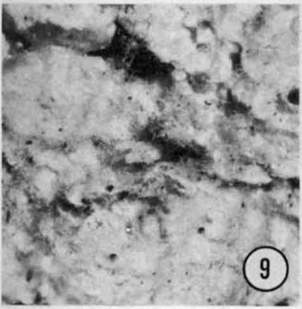
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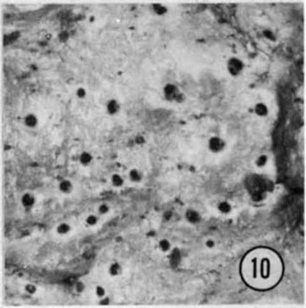
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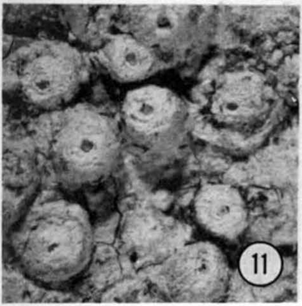
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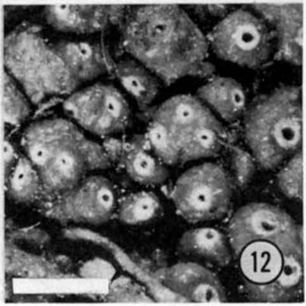
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MYCOTAXON

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# TYPE STUDIES ON CLAVARIOID FUNGI. V.
# A FEW AUSTRALASIAN TAXA.

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As cited in other papers (Petersen, 1978a, b), I had the privilege of collecting clavarioid fungi in Australia in 1977. As valuable as field experience may be, however, the foundation of taxonomy remains the type method, and an incorrect interpretation of names only adds confusion to the literature instead of order.

All of the taxa reported herein either were described from Australian specimens or were suspected of occurring there. Because all were treated in some way by Corner (1950, 1970), the best authority on Pacific clavarioid fungi, no surprises were anticipated in the examination of these types, but surprises were forthcoming nonetheless. These are included in the comments following each taxon.

*Clavaria archeri* Berkeley. 1860 Fl. Tasmanica, t. 188, fig. 3 (teste Corner, 1950).

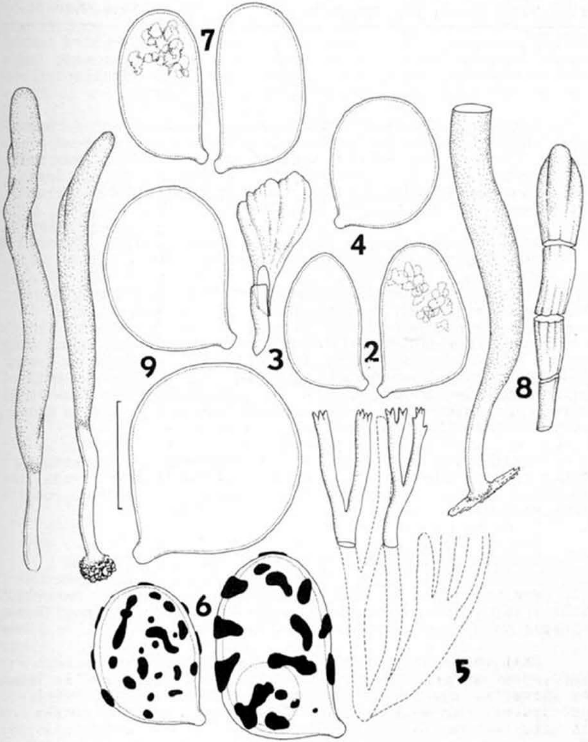
Type: K - Tasmania, no date, s.n.

Fruit body (one) in two fragments (fig. 3), total about 2.5 cm high, about 8 mm broad, simple, laterally flattened (thickness about 1.5 mm), solid; apex shallowly lobed.

Basidia 55-65 X 6.2-6.8 µm, clavate, clamped, somewhat refringent under phase contrast; contents homogeneous (in preservation?) to obscurely heterogeneous but not clearly guttulate; sterigmata 4, stout, conical, divergent, not cornute.

Spores (fig. 4) 5.6-6.7 X 5.2-6.0 µm ($\underline{E}$ = 1.07-1.21; $\underline{E}^m$ = 1.15; $\underline{L}^m$ = 6.32 µm), subglobose to very broadly ellipsoid, usually slightly flattened adaxially; wall thin; contents homogeneous; apiculus papillate, less than 1 µm long.

Although presumably an aberrant fruit body, almost all descriptions of the taxon have faithfully reproduced the idea of the flabellately clavate apex, either because of some reference in the original description (which I have not seen), or examination of the type specimen.



Explanation of figures

Figs. 1, 2. *Clavaria aurantia*. 1. Fruit bodies. 2. Spores. Figs. 3, 4. *Clavaria archeri*. 3. Fruit body. 4. Spore. Figs. 5, 6. *Clavaria lorithamnus*. 5. Fruit body, showing outline of missing portions in dashed lines. 6. Spores. Fig. 7. Spores of *Clavaria muelleri*. Figs. 8, 9. *Clavaria tasmanica*. 8. Fruit bodies. 9. Spores. Standard line = 5 µm for spores, 0.5 cm for fruit bodies.

Microscopically, the taxon is clearly part of the *Clavulinopsis amoena - C. miniata* complex, and may well be contaxic with *C. amoena*. It is surely not the elongate-spored taxon envisioned by Corner. Many spores are semi-collapsed, and become pleated, appearing elongate, but when uncollapsed spores are examined, they are always as above.

Corner (1950: 355) synonymized *C. archeri* and *C. aurantia*, reporting that he had examined both types at Kew. Later (Corner, 1970: 72) he opined that *C. archeri* was near *C. pulchra* ( = *C. laeticolor*), also erroneous, for *C. laeticolor* spores exhibit the very long apiculus of a different subgenus.

*Clavaria aurantia* Cooke & Massee in Cooke. 1887. Grevillea 16: 33.

Type: K - Harkaway Range, Victoria, C. French, Sen., vi. 1887, no. 8108.

Fruit bodies (fig. 1) (two) up to 4 cm long, up to 3 mm broad, simple. Stipe up to 1.5 mm thick, up to 10 mm long, clearly differentiated from club, equal, inserted in soil without subiculum, smooth but not glabrous. Club somewhat laterally compressed, smooth; apex tapering to nearly equal, abruptly hemispherical (cf. fig. from type).

Basidia up to 70 X 7.5 µm, elongate-clavate, clamped; contents minutely granular, often with amorphous crystalline material in upper portion; sterigmata (2-3)-4, stout, conical, divergent.

Spores (fig. 2) 6.3-7.0 X 3.7-4.8 µm ($\underline{E}$ = 1.46-1.90; $\underline{E}^m$ = 1.70; $\underline{L}^m$ = 6.74 µm), ellipsoid, usually somewhat flattened adaxially; wall very thin; contents homogeneous (in preservation?) to including amorphous granular material (the remnants of a guttule?); apiculus eccentric, papillate, up to 1 µm long.

Most spores are in some state of collapse, but none were seen with the characteristic amygdaliform profile shown by Corner (1950: 342). Conversely, I have examined many specimens of this taxon, and some seem to produce spores lacking the distal attentuation, while others show this feature clearly, although in various percentages of total spores examined. I consider that the taxon fits well with other elongate-spored members of *Clavulinopsis*, such as *C. gracillima*, *C. maricola*, etc. Most assuredly, however, *C. aurantia* is not synonymous with *C. archeri*, as reported by Corner.

*Clavaria lorithamnus* Berkeley. 1873. J. Linnean Soc. Bot. 13: 169.

Type: K - Dandenong, Australia. Herb. Berkeley, s.n.

Fruit body (fig. 5) (one) in fragments (two), apparently the ultimate 2 cm of two branch systems; about 4 cm high, about 2 cm broad (pressed), branched. Stipe tapering downward, fasciculate (at least two fascicles in original specimen); branches dichotomous, up to 3 mm thick; axils narrowly rounded; apices dentate to minutely digitate.

Tramal hyphae up to 12 µm diam, hyaline, without clamp connections, parallel, thin-walled. Basidia without clamps, collapsed.

Spores (fig. 6) 6.3-8.2 X 4.8-5.6 µm ($\underline{E}$ = 1.29-1.54; $\underline{E^m}$ = 1.44; $\underline{L^m}$ = 7.31 µm), broadly cylindrical to broadly ellipsoid; wall up to 0.3 µm thick; contents homogeneous to minutely granular; ornamentation of scattered low warts which hardly anastomose into ridges; apiculus conical, truncate.

This is surely *Ramaria sinapicolor* (Cleland) Corner. Corner (1950, 1970) persisted in his interpretation of this taxon as a *Ramariopsis*, even after examining the type. Comparision of his illustrations of the spores of *C. lorithamnus* (1950: 644) with *Ramaria* spores (i.e. *R. polypus*, 1950: 617) reveals very little difference, surely not enough on which to separate genera.

*Clavaria kalchbrenneri* Mueller may be synonymous, but I have not seen type material so abstain from conclusions.

*Clavaria miltina* Berkeley. 1852. London Jour. Bot.: 140.

Type: K - Khasia no. 3, K. no. H1232/77, 2.

I reported on this type specimen previously (Petersen, 1967), but because Australia seems inhabited by several deeply pigmented clavarioid fruit bodies, it seemed worthwhile to examine the specimen again, especially after an additional decade of experience with such fungi. Interestingly, the only additional data which now can be supplied are as follows: 1) hyphae of at least the smaller fruit body are clamped, and 2) tramal hyphae of both fruit bodies involve quantities of amorphous crystalline material. On the contrary, I saw no basidia and no spores this time, but there is evidence of a third fruit body from which these reports may have come, but now is all but missing.

Because the data seem so meager and equivocal, I will henceforth treat the name as a *nomen dubium* on the paucity of type material. Berkeley contrasted the taxon to *Calocera*, and the meager evidence of holobasidia supports this.

*Clavaria muelleri* Berkeley in Cooke. 1891. Grevillea 20: 10.

Type (lectotype, des. mihi): K - Queensland, s.n.

Fruit bodies (two) up to 3 cm high, up to 1.2 mm broad, simple. Stipe up to 0.7 mm thick, up to 4 mm long, equal, easily distinguished from club, inserted nakedly in soil, smooth, perhaps glabrous when fresh. Club narrowly fusiform, smooth, narrowly rounded apically.

All microscopic structures agglutinated or coherent through preservation. Basidia apparently very short (less than 30 µm long).

Spores (fig. 7) 6.7-8.2 X 3.7-4.1 µm ($\underline{E}$ = 1.80-2.20; $\underline{E}^m$ = 1.91; $\underline{L}^m$ = 7.33 µm) short cylindrical, thin-walled, mostly collapsed.

The spores are in various stages of collapse, and although I cannot find clamp connections, I have been unable also to clearly see crosswalls, so clamps may have escaped me. Spore shape and white fruit bodies would suggest *Clavaria vermicularis* Fr., as surmised by Corner (1950), but I do not wish to conjecture unduly and will henceforth treat the name as a *nomen dubium* until better material can be unearthed.

Even the meager microscopic observations indicate that the taxon is not a *Clavulinopsis* for nomenclatural reasons. The specimen from Queensland is selected as lectotype, but the description above is taken from both specimens at K. Two locations (Victoria, Queensland) were mentioned in the protologue. The second K specimen bears the following: "no. 79. 1867. April. Neercool Creek." I assume this to be the Victoria material.

*Clavaria portentosa* Berkeley & Broome. 1882. Trans. Linnaean Soc. II 2: 65.

Type: K - Brisbane, no. 426 (in part), F. M. Bailey, pl. xiv, fig. 17, Herb. C. E. Broome.

Fruit body (one) 11.5 X 5 cm, branched up to five ranks, now virtually black and strongly cartilaginous; branching thelephoroid, of many flattened and anastomosing lower portions arising from wood and leaves and surrounding long portions of the monocot leaf and stem fragments; middle branches flattened, rebranched in polychotomous fashion into ultimate branchlets; apices up to 1.5 cm long, less than 1 mm thick, acerose to subulate, terete, prolonged, irregularly dichotomous.

Tramal hyphae 3-12 µm diam, refringent under phase contrast, thin-walled upward, thick-walled (wall up to 2 µm thick) in lower portions, without clamp connections. Basidia not observed.

Spores 5.7-6.4 X 4.5-5.0 µm, ellipsoid, smooth, hyaline; contents refringent under phase contrast; wall thin; hilar appendix papillate, small.

On cursory examination, the fruit body appears to have a long, thick stipe, and is reminiscent of *Ramaria zipellii*. Hyphal construction and spore morphology dictate that it is an *Aphelaria* ss. Corner (1950), however, and as such it matches the circumscription of *A. flabellata* (Wakefield) Corner (1950). Petersen (1969) reported on the type specimen of *Clavaria* (*Apheleria*) *complanata* Cleland, which also matches this collection except for fresh color. The two taxa differ so little (except in described colors) that they may simply be stages in a single species, but because the name *C. portentosa* antedates both, a new combination seems required, as follows:

*Aphelaria portentosa* (Berkeley & Broome) Petersen, comb. nov.

Bas: *Clavaria portentosa* Berk. & Broome. 1883. Trans. Linnaean Soc. II 2: 65, pl. 14, fig. 15.

I regard *A. flabellata* as synonymous, and *A. complanata* as probably so.

*Clavaria tasmanica* Berkeley in Cooke. 1891. Grevillea 20: 10.

Type: K - s.n., no data except "Clavaria tasmanica B., five fragments." Within packet is a small packet and a small label: "Tasmanica B. Type" in Corner's hand.

Fruit bodies (fig. 8) (two) in fragments, probably about 2 cm high, about 2 mm thick, simple, deep olive-gray; stipe about 1 mm thick, up to 6 mm long, equal, arising from off-white subiculum which extends up to 2 mm; club smooth, deeply pigmented, elongate-fusiform; apex rounded to irregularly subrugose or lobed, but not branched.

Tramal hyphae up to 20 µm diam, thin-walled, clamped, roughly parallel, not agglutinated, under bright field pale golden (indicating pigmentation). Hymenium greatly thickened, easily separated from trama; basidia up to 80 X 8 µm, subcylindrical; basidial contents golden under bright field; post-partal septation apparently lacking; sterigmata two, cornute. Cystidia none.

Spores (fig. 9) 7.4-8.9 X 6.3-8.1 µm ($\underline{E}$ = 1.00-1.29; $\underline{E}^m$ = 1.12; $\underline{L}^m$ = 8.17 µm), globose to subglobose, smooth, somewhat refringent under phase contrast, very pale golden under bright field (pigmented?); wall thin; contents now homogeneous; hilar appendix papillate.

The specimen represents a simple, dark-colored *Clavulina* with clamps, pigmented hyphae and no cystidia. All these characters, as well as the easily separable hymenium match those of *Clavaria* (*Clavulina*) *geoglossoides* Corner. That species, represented by only the type at MELU, is somewhat dubious, for the type is heavily infected with a dark mycelium which may account for Corner's (1970) report of cystidia. I consider the two names synonymous.

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MYCOTAXON

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# ETUDE SUR LES CHAMPIGNONS PARASITES DU SUD-EST ASIATIQUE. 31. LES CERCOSPORA DE FORMOSE. IV.

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### *ABSTRACT*

This report deals with three species of pathogenic fungi which are parasitic in the leaves of sugarcane in Taiwan. Two of them are new: *Cercospora whalianensis* nov. sp. and *Leptosphaeria kuangfuensis* nov. sp.

En étudiant les échantillons récoltés à Formose par M. Shou-kung SUN, Professeur de Phytopathologie à l'Université National de Chung Hsing, nous avons trouvé deux champignons nouveaux parasites des feuilles de la canne à sucre: *Cercospora whalianensis* nov. sp. et *Leptosphaeria kuangfuensis* nov. sp.

## 1. Cercospora whalianensis Yen et Sun, nov. sp.

(FIG. 1, A-C)

### *Description du champignon*

Sur les feuilles du *Saccharum officinarum* (clone F 173) (Graminées), à Kuangfu, Whalian, Formose, leg. Shou-kung Sun (S.K.S. *114*), 12 août 1977.

Macules invisibles. Fructifications amphigènes, invisibles à l'oeil nu, même à la loupe. Stromas absents.

Hyphes externes amphiphylles, sortant de l'ostiole des stomates, brun olivâtre pâle, ramifiées, cloisonnées, 2.0-2.5 µm de large (FIG. 1, A et B).

Conidiophores toujours solitaires, émis latéralement par les hyphes externes, droits ou arqués, brun olivâtre pâle sur toute la longeur, cloisonnés (1-4), 10-45 × 3.0-3.5 µm, avec 0-1 géniculation et à apex arrondi ou coudé et orné d'une ou deux cicatrices conidiennes brun noir (FIG. 1, A et B).

Conidies cylindriques ou filiformes, brun olivâtre pâle, droites ou légèrement arquées, divisées par 1-11 cloisons transversales, à apex arrondi, à base subtronquée et ornée d'une cicatrice brun noir, 20-90 × 2.0-3.0 µm (FIG. 1, C).

### *Caractères taxinomiques*

D'après Butler (1906), Matsumoto et Yamamoto (1934), Yen et Chi (1952), Chupp (1953), Yen, Lo et Chi (1953), Sun (1955) et Yen (1958), il existerait sept espèces de *Cercospora* parasites du *Saccharum* (*C. atrofiliformis* Yen, Lo et Chi, *C. sacchaicola* Sun, *C. taiwanensis* Mats. et Yam., *C. kopkei* Krueg., *C. longipes* Butl., *C. rubropurpurea* Sun, et *C. vaginae* Krueg.), chacune d'entre elles montrant des macules caractéristiques et de couleur constante. Par contre, notre récolte ne présente aucune trace de macules. Nous considérons donc ce champignon comme nouveau, avec la diagnose suivante:

**Cercospora whalianensis** nov. sp. Maculis nullis. Caespitulis amphiphyllis. Stromatibus nullis. Hyphis sterilibus amphiphyllis, ex stomatibus oriundis, septatis, ramosis, pallide brunneo-olivaceis, 2.0-2.5 µm crassis. Conidiophoris amphiphyllis, solitariis, pallide brunneo-olivaceis, ex hyphis sterilibus oriundis, simplicibus, erectis vel curvatis, 1-4 septatis, 0-1 geniculatis, ad apicem rotundatis et 1-2 cicatricibus conidiorum manifestibus, 10-45 × 3.0-3.5 µm. Conidiis cylindraceis vel filiformibus, pallide brunneo-olivaceis, rectis vel leniter curvatis, 1-11 septatis, antice rotundatis, inferne cylindraceis, cellula basali in hilum subtruncatum et atrobrunneum, 20-90 × 2.0-3.0 µm.

Habitat in foliis vivis *Sacchari officinari* (F 173), Kuangfu, Whalian, Formosa, ad Shou-kung Sun (S.K.S. *114*), 12 Aug. 1977.

## 2. CERCOSPORA LONGIPES Butl.

Mem. Dept. Agr. India, Bot. Ser. 1(3): 44, 1906

(FIG. 1, D et E)

Sur les feuilles du *Saccharum officinarum* (clone F 173) (Graminées), à Kuangfu, Whalian, Formose, leg. Shou-kung Sun (S.K.S. *113*), 12 août 1977.

Macules très nettes, uniformément brun ou brun foncé, grisâtres au centre chez les plus âgées, isolées, dispersées sur toute la surface de la feuille, fusiformes ou oblongues, 1-4 × 0.2-1.5 mm.

Fructifications amphigènes, invisibles à l'oeil nu, mais laissant voir, à la loupe, des petits poils noirs correspondant aux fascicules de conidiophores du champignon. Stromas absents.

Conidiophores amphiphylles, sortant de l'ostiole des stomates, en fascicules par groupe de 3-16, simples, érigés ou flexueux, uniformément bruns, cloisonnés (4-15), avec 0-8 petites géniculations, à apex arrondi ou coudé et souvent orné d'une cicatrice des spores brun noir, mesurant 25-135 × 3.0-4.0 µm (FIG. 1, D).

Conides hyalines, obclaviformes, droites ou arquées, divisées par 3-9 cloisons transversales, à apex mince or filiforme (à peine 1.0 µm de diamètre), à base subtronquée et couronnée d'une cicatrice brun noir, mesurant 45-85 × 3.0-4.0 µm (FIG. 1, E).

D'après Butler (1906) et Hughes, Abbott et Wismer (1964), la maladie de "Brown Spot" de la canne à sucre, provoquée par

*Cercospora longipes* Butl. est non seulement commun aux Indes, mais aussi dans les autres pays tropicaux sauf Australie et Formose. Toutefois Dr. W. L. Hsieh a trouvé tout récemment (avril 1977 par correspondance personnelle) l'existance de ce champignon à Formose.

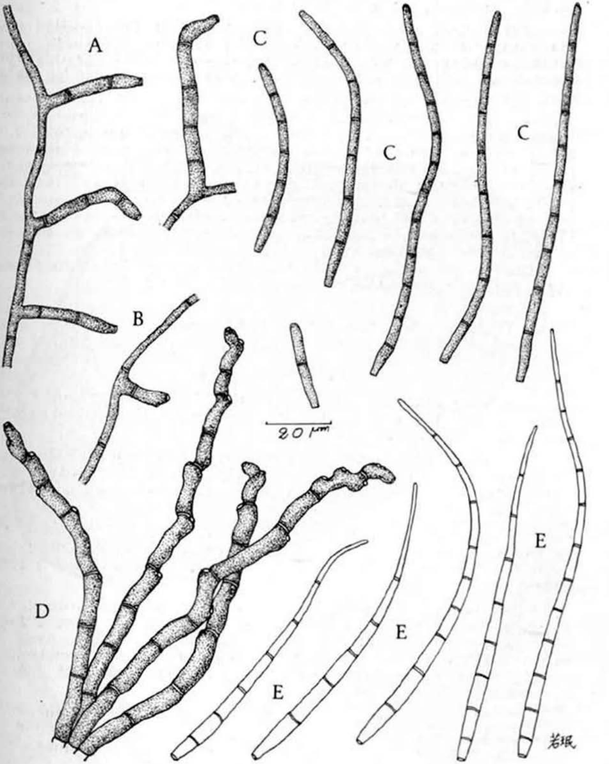

FIG. 1. A-C, *Cercospora whalianensis* Yen et Sun: A et B, Hyphes externes et conidiophores solitaires; C, Conidies. D et E, *Cercospora longipes* Butl.: D, Conidiophores âgés; E, Conidies.

### 3. Leptosphaeria kuangfuensis Yen et Sun, nov. sp.

(FIG. 2)

*Description du champignon*

Sur les feuilles du *Saccharum officinarum* (clone F 173) (Graminées), a Kuangfu, Whalian, Formose, leg. Shou-kung Sun (S.K.S. *113bis*), 12 août 1977.

Périthèces amphiphylles, endogènes, se développant dans les tissus de la feuille, brun noir, isolés, dispersés, globuleux-applatis, à paroi assez épaisse et constituée par 3-6 couches de cellules polygonales brunes; mesurant 80-90 μm de haut sur 123-155 μm de large (FIG. 2, A).

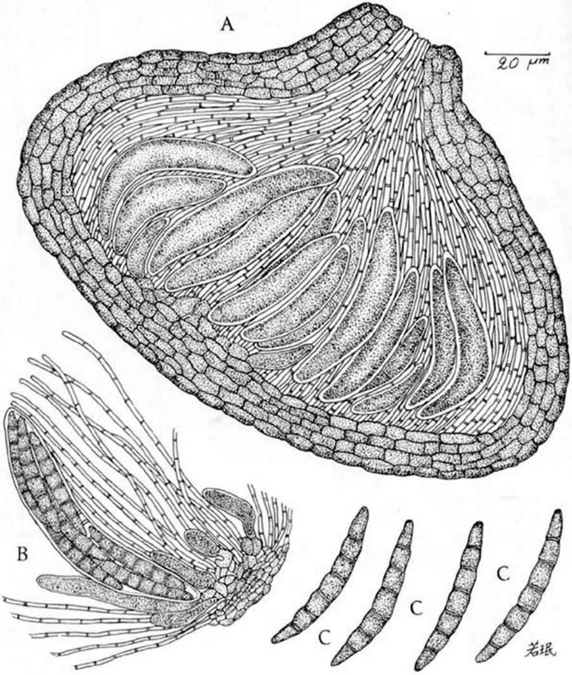

FIG. 2. *Leptosphaeria kuangfuensis* Yen et Sun: A, Jeune périthèce; B, Asques et paraphyses; C, Ascospores.

Asques hyalins, longuement fusiformes, légèrement arqués, à deux extrémités coniques, nombreux, naissant parallèlement à la base de la cavité périthéciale, non pédicellés, octosporés, à membrane lisse et mince (1.0-1.5 µm), 50-58 × 10-12 µm; paraphyses filiformes, simples, hyalines, cloisonnées, très nombreuses, mesurant 1.0-1.5 µm en diamètre (FIG. 2, B).

Ascospores longuement fusiformes, brun pâle, à deux extrémités coniques, droites ou légèrement arquées, divisées par 6 (parfois 7) cloisons transversales, 22-25 × 3.5-4.0 µm (FIG. 2, C).

### *Caractères taxinomiques*

Selon Matsumoto (1952), Yen et Chi (1952) et Hughes, Abbott et Wismer (1964), il existerait deux espèces de *Leptosphaeria, L. sacchari* Breda de Haan et *L. taiwanensis* (Mats. et Yam.) Yen et Chi, parasites des feuilles de *Saccharum officinarum.* Ces deux espèces possèdent des ascospores divisées par trois cloisons transversales, tandis que les ascospores de notre récolte ont 6 (parfois 7) cloisons transversales. Par conséquent, ce champignon est considéré comme nouveau, avec la diagnose suivante:

**Leptosphaeria kuangfuensis** nov. sp. Peritheciis amphiphyllis, endogenis, solitariis, sparsis, atris, glabris, leviter ostiolatis, plano-globosis, pariete membranaceis, fere atrobrunneis, 80-90 µm altis, 123-155 µm latis. Ascis hyalinis, levibus, octosporis, fusiformibus, utrinque conicis, non-stipitatis, 50-58 × 10-12 µm. Paraphysis hyalinis, simplicibus, septatis, tenuis, 1.0-1.5 µm crassis. Ascosporis longo-fusiformibus, pallide brunneis, utrinque conicis, rectis vel lenissime curvatis, semibiseriatis, 6(-7)-septatis, ad septa lenissime constrictis, 22-25 × 3.5-4.5 µm.

Habitat in foliis vivis *Sacchari officinari* (F 173), Kuanfu, Whalian, Formosa, ad Shou-kung Sun (S.K.S. *113bis*), 12 Aug. 1977.

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# NOTICE

## IMA NOMENCLATURE SECRETARIAT RECONSTITUTED

At the Second International Mycological Congress, held in Tampa, Florida, in 1977, the International Mycological Association's Nomenclature Committee reconstituted its Secretariat, which will function to coordinate the efforts of the IMA Nomenclature Subcommittees until the Third International Mycological Congress.

All questions concerning the IMA Nomenclature Committee and suggestions for additional subjects for study should be addressed to any member of the Nomenclature Secretariat for action by the IMA Committee.

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# NOMENCLATURAL AND TAXONOMIC NOTES ON LASIOBELONIUM, ERIOSCYPHA AND ERIOSCYPHELLA

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## *SUMMARY*

*Lasiobelonium* Ell. & Everh. (1897), of which *L. subflavidum* is the monotype, is a later synonym of *Dasyscyphus* (sensu lato). *L. subflavidum* is a later synonym of *D. borealis*, which in turn is the holotype species of *Belonidium* subg. *Phaeobelonidium*. It is not, as has been suggested, a synonym of *Perrotia flammea*.

*Lasiobelonium* (Sacc.) Sacc. & Syd. (1899) is two years younger than *Lasiobelonium* Ell. & Everh., and hence an illegitimate later homonym. It is doubly illegitimate since when erected at subgeneric rank it included the holotype of the generic name; it is automatically typified by *Belonidium aeruginosum*. A later typification by *L. amoenum* provided Dennis (1962) and Korf (1973, 1977) with a generic concept that now requires a new generic name for at least two of the species. All 8 species referred to *Lasiobelonium* are discussed, and appropriate transfers noted on the basis of type studies. The spelling *Lasiobelonis* is explained.

*Erioscypha* Kirschstein (1938) is lectotypified here with *E. kriegeriana*, and that species is transferred to *Dasyscyphus*. It is congeneric with *D. borealis*, and the generic name is a synonym of *Belonidium* subg. *Phaeobelonidium (= Dasyscyphus)*.

*Erioscyphella* Kirschstein (1938) is briefly noted as taxonomically artificial but nomenclaturally available.

## I. LASIOBELONIUM: TWO HOMONYMS

It is necessary to distinguish between two homonymous generic names: *Lasiobelonium* Ellis and Everhart (1897) and *Lasiobelonium* (Sacc.) Saccardo and Sydow (1899).

Let us first examine the status of *Lasiobelonium* Ell. & Everh. In their paper, Ellis and Everhart (1897) record *L. subflavidum* Ell. & Everh. as a new species on *Salix* wood from the state of Washington. Though they did not indicate that this was a new generic name, *Lasiobelonium* does not appear in that rank so far as is known in any of the literature prior to that date. We are thus forced to consider this *a combined description of a monotypic new genus and new species* (International Code of Botanical Nomenclature, Art. 42), since there is no indication whatsoever from where the generic name may have come.

The description of *L. subflavidum* is short by modern standards. Though the Ellis collections are housed at the New York Botanical Garden, Seaver (1951) apparently never examined the material, for he records it in the "Doubtful and Excluded Species" of *Lachnella* with the comment: "The description of this species suggests *Perrotia flammea*." Dennis (1963) reported that: "No apothecia remain on the type collection, but Ellis's notes on the packet include the unpublished information that the ascospores become 1-3 septate. This and the substrate is consistent with Seaver's suggestion that the fungus was *Perrotia flammea*."

I have examined the ISOTYPE material of this species, W. N. Suksdorf *489*, on deposit at WSP, and find that it bears apothecia in a fairly good state of preservation. It is certainly not *Perrotia flammea* (Alb. & Schw. *per* Pers. : Fr.) Boud., but instead is *Dasyscyphus borealis* (Ell. & Holw.) Sacc. (non *D. borealis* K. & L. Holm, Symb. Bot, Upsal. 21(3): 13. 1977, a later homonym), with fusoid, 1- to 3-septate ascospores and asci with a strongly J+ ascus pore. The generic name thus falls into synonymy with *Dasyscyphus* Nees *per* Gray in my sense, and with *Belonidium* Mont. & Durieu *in* Durieu subg. *Phaeobelonidium* Raitvĭir (1970), which has *Peziza borealis* Ell. & Holw. as its holotype.

Two years after Ellis and Everhart had published their new species (and implied new genus), Saccardo and Sydow (1899) catalogued Ellis and Everhart's species in the Sylloge Fungorum under the generic name "*Lasiobelonium* Sacc." At that point they referred back to the earlier *Belonidium* subg. *Lasiobelonium* Saccardo (1889). They should have written "*Lasiobelonium* (Sacc.) Sacc. & Syd." according to modern nomenclatural methodology.

Presumably Saccardo and Sydow believed that Ellis and Everhart had not published a new, monotypic genus, but instead had described a species within a Saccardoan subgenus that was to be raised to generic rank. For the record, I, too, believe that Ellis and Everhart were well aware of Saccardo's subgenus and that they assigned their new species to that subgenus at generic rank — but that is only a belief, not a demonstrable fact.

Some might wish to argue that Ellis and Everhart's new species is itself not validly published because the generic name *Lasiobelonium* (Sacc.) Sacc. & Syd. was not validly published previously (International Code of Botanical Nomenclature, Art. 43). This would unquestionably be true had Ellis and Everhart described *two* or more species of *Lasiobelonium* without a generic diagnosis; since they described only one, Art. 42 on monotypic new genera necessarily applies, and *Lasiobelonium* Ell. & Everh. has that species as its monotype.

Even if we could convince ourselves that *Lasiobelonium* Ell. & Everh. is invalid, we still could not adopt *Lasiobelonium* (Sacc.) Sacc. & Syd. as Dennis (1962) and Korf (1973, 1977) have done, since Saccardo (1889) made a serious initial nomenclatural error. *Belonidium* Mont. & Durieu *in* Durieu (1848) was originally monotypic, based on *B. aeruginosum* Mont. & Durieu *in* Durieu. Saccardo (1884) had erected the subgenus *Belonidium* subg. *Arachnopeziza* (Fuckel) Sacc. When Saccardo (1889) erected three new subgenera of *Belonidium*, subg. *Eu-Belonidium* [Sacc.], subg. *Lasiobelonium* Sacc., and subg. *Podobelonium* Sacc., he made the fatal error of including the generic holotype species, *B. aeruginosum*, in subg. *Lasiobelonium*.

The correct name for the subgenus of *Belonidium* containing the type species is *Belonidium* subg. *Belonidium* (ICBN, Art. 22), as correctly adopted by Raitviir (1970). The subgeneric epithet *Lasiobelonium* is not only *superfluous*, but *automatically typified* by *B. aeruginosum* (ICBN, Arts. 7 and 63). The generic name *Lasiobelonium* (Sacc.) Sacc. & Syd. is typified by the type of its basionym, and is thus nomenclaturally tied to *B. aeruginosum*. It is necessarily as illegitimate as its basionym, and cannot be typified by another species, *L. amoenum* (Speg.) Sacc. *ex* Clem. & Shear as was attempted by Clements and Shear (1931) and accepted by Dennis (1962).

Only eight species have been formally treated under the generic name(s) *Lasiobelonium*. I have examined type or authentic material of seven of these, with the following taxonomic conclusions:

1. LASIOBELONIUM AQUILINELLUM von Höhnel (1907): The HOLOTYPE material on deposit at FH shows this to be a member of a new genus typified by *Peziza miniopsis* Ellis (*vide infra*, no. 6). It is illustrated and described in my monograph of the Polydesmieae (Korf, 1978).

2. LASIOBELONIUM AMOENUM (Speg.) Sacc. *ex* Clements and Shear (1931) (ut 'Lasiobelonis'): The HOLOTYPE material at

LP was examined by me in 1950, at which time I concluded that though badly preserved, the specimen might represent *Dasyscyphus apalus* (Berk. & Br.) Dennis, a species known from north temperate areas on Juncaceae, with fusiform paraphyses and finely granulate hairs. Dennis (1962) concluded otherwise: "The type material of this in Spegazzini's herbarium is in poor condition but appears to me to have smooth hairs and filiform paraphyses ...." The type specimen is now in such fragmentary condition that it cannot again be loaned (Irma Gamundí de Amos, *pers. comm.*), and all I can judge on now is the description and a single slide preserved at Kew, made either by Dr. Dennis or by me, of one apothecium in which little can be discerned. I find no granularly roughened hairs, but I do see fusoid structures which I may have earlier concluded were paraphyses. Since I find septa frequently in these, I tend to believe thay are fusoid, smooth hairs. No mature asci are evident, and no ascospores appear to be cut out. I am, therefore, quite unable to conclude whether Dennis (1962) was correct in suggesting that Spegazzini's species is congeneric with *L. aquilinellum* and *L. miniopsis*. Dr. Gamundí de Amos is currently studying the Discomycete flora of Tierra del Fuego, from where this was described on *Rostkovia grandiflora* (Juncaceae). Additional collections should allow an accurate determination of the generic placement of Spegazzini's species. It should be noted that when Clements and Shear (1931) attributed the combination to Saccardo, they also gratuitously respelled *Lasiobelonium* as *Lasiobelonis*, in keeping with their stated procedure: "Names of more than six syllables have been shortened in such a manner as to preserve their identity."

3. LASIOBELONIUM DUMONTII Korf (1977): The HOLOTYPE material at NY has been restudied and proves to be a species of *Polydesmia*. I have transferred it to that genus and illustrated it again in the Polydesmieae monograph (Korf, 1978).

4. LASIOBELONIUM GLOBULARE von Höhnel (1909): The HOLOTYPE specimen (FH: Höhnel *A.5335*) matches perfectly von Höhnel's description. This is a species closely allied to, but apparently distinct from, *Dasyscyphus rhaphidophorus* (Berk. & Curt.) Dennis (1954). It has similarly fusoid but broader and septate ascospores. In the one apothecium I sectioned, I measure the ascospores 31-38 × 4.0-4.4 µm, eventually 3-septate, while von Höhnel, who apparently saw more mature spores, records them as 40-50 × 5.0-5.5 µm, and 5- to 8-septate. It is to be transferred as **Dasyscyphus globularis** (Höhn.) Korf, *comb. nov.* (basionym: *Lasiobelonium globulare* Höhn., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl., Abt. 1, 118: 387. 1909).

5. LASIOBELONIUM LACHNOIDES Rehm (1905): There is, surprisingly, no material under this name in the Rehm herbarium at S. The species was described from Kmet's Hungarian collections. I was sent an AUTHENTIC specimen from the Sydow herbarium at Stockholm, labelled "*Lasiobelonium lachnelloides* Rehm, n. sp.," collected by Kmet in Hungary on one of the cited hosts, collected some years prior to Rehm's publication, and presumably an ISOSYNTYPE. It fits Rehm's diagnosis perfectly. The difference in spelling of the epithets is presumably an error, more likely in publication than on the packet label, for Rehm (1905) wrote: "Lachnellae extus similis ...." The specimen is a collection of *Dasyscyphus borealis* (Ell. & Holw.) Sacc. in excellent condition, and Rehm's species falls into synonymy with it. Rehm correctly noted his species as "proxima Lasiobelonio subflavido Ellis et Ev.," for I identify both as *D. borealis* (*vide infra*, no. 7).

6. LASIOBELONIUM MINIOPSIS (Ellis) Dennis (1962): This species was treated in *Dasyscyphella* by Kanouse (1938) and by Korf (1952) before Dennis transferred it to *Lasiobelonium*. The HOLOTYPE specimen is on deposit in NY. This species now constitutes the type of a new genus, in which *L. aquilinellum* (*vide supra*, no. 1) is a second species, and is treated in detail and illustrated in my monograph of the Polydesmieae (Korf, 1978).

7. LASIOBELONIUM SUBFLAVIDUM Ell. & Everh. (1897): I have discussed the HOLOTYPE and ISOTYPE specimens above in my comments on the taxonomic position of the genus, and my assignment of the species to synonymy under *Dasyscyphus borealis*.

8. LASIOBELONIUM TORRENTIUM Ade & Rehm *in* Ade (1923): I have been unable to locate Ade's herbarium, and no specimen of this is in Rehm's herbarium at S (where the herbarium had already been received in 1919). The description suggests a lanceolate paraphysis-bearing species of *Dasyscyphus*.

## II. ON ERIOSCYPHA

Kirschstein (1938) proposed the generic name *Erioscypha* for a new species, *E. kriegeriana* Kirschst., and four additional species presumably known to him only from the literature. It was proposed as a one-character genus, differing from *Dasyscyphella* Tranzsch. (*i.e.*, filiform-paraphysis species of *Erinella* sensu Saccardo) in having colored ascospores. A holotype species was not designated.

A reinvestigation of the HOLOTYPE specimen of *E. krigeri-*

*ana*, on deposit in B, shows this species, on cone-scales of *Picea*, to be a short-stipitate species of *Dasyscyphus*, anatomically closely related to those species Raitvĭir (1970) has ranged in *Belonidium* subg. *Phaeobelonidium*. It is most unfortunately only poorly preserved, but the description by Kirschstein appears to be correct in most particulars. To his observations I can add that the apothecia are xanthochroic, the hairs are smooth below and granularly roughened above the first septum, brown and paler towards the tips, and the asci are J+. I hereby designate this species as the LECTOTYPE of Kirschstein's generic name, since clearly it is the species Kirschstein had most in mind when erecting the genus, and since it agrees well with the generic diagnosis. It should, however, be transferred as Dasyscyphus kriegerianus (Kirschst.) Korf, *comb. nov.* (basionym: *Erioscypha kriegeriana* Kirschst., Ann. mycol. 36: 383. 1938).

Of the other four species placed in *Erioscypha* by Kirschstein: *E. miniopsis* (Ellis) Kirschst. has hyaline, coiled to crisped hairs, was treated in *Lasiobelonium* by Dennis (1962) and by Korf (1973, 1977), and is the type species of a new genus (Korf, 1978) discussed above in Part I of this paper; *E. calospora* (Pat. & Gaill.) Kirschst. and *E. subcorticalis* (Pat.) Kirschst. are both hyaline-haired species of *Dasyscyphus* (Dennis, 1954); and *E. cognata* (Pat.) Kirschst. is a synonym of *D. rhaphidophorus* with hyaline hairs becoming buff in age (Dennis, 1954).

The colored-spore character seems to have little significance in this group of fungi. Though the spores of *E. kriegeriana* were described as "initio flavis, postremo brunneis," I find them at most pale yellow, and that perhaps the result of tannins in the cone scales. Saccardo used the terms "lutescentibus," "viridulus," "chlorinis," and "hyalinis, chlorinus" for the spores of the other four species included by Kirschstein. There is no evidence that Kirschstein ever examined material of any of the four. I have never noted colored ascospores in *"E." miniopsis*, and Dennis (1954, 1970) makes no mention of colored spores in his descriptions of the other three species.

## III. ON ERIOSCYPHELLA

The artificiality of Kirschstein's one-character generic concepts is further attested to by his genus *Erioscyphella* Kirschstein (1938). This generic split was proposed for colored-spored species of *Erinella* sensu stricto, *i.e.*, differing from *Erioscypha* in having lanceolate rather than filiform paraphyses. It is again clear that he saw no material, for he acknowledged taking his diagnoses for the two included species from Saccardo's Sylloge Fungorum. Neither *Erioscyphella longispora* (Karst.) Kirschst. nor *E. bambusina* (Bres.) Kirschst. was designated the type of the generic name. Both were treated as brown-haired species of *Dasyscyphus* by Dennis (1954), who made no mention of color in the ascospores. I do not choose to designate a lectotype species here, since depending upon which species is chosen the generic name may have some potential use for those determined to split *Dasyscyphus* into smaller and more manageable genera. Kirschstein's final comment, on the lack of complete information in the Sylloge Fungorum, deserves repetition, for it underlines his unfortunate philosophy of classification: "Da die Angabe der Paraphysen fehlt, so ist es zweifelhaft, ob *Erinella rhabdocarpa* Ellis dieser [*Erioscyphella*] oder der vorbesprochenen Gattung [*Erioscypha*] angehört."

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# NOTES ON CORTICIACEAE (BASIDIOMYCETES) III.

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## SUMMARY

A new genus, Uncobasidium, and the species Uncobasidium luteolum and Byssocorticium efibulatum are described. Uncobasidium is characterized by basidia with an unusual basal hook and B. efibulatum by a total lack of clamps.

UNCOBASIDIUM Hjortst. & Ryv. nov. gen.

Fructificatio resupinata, effusa; hymenio submembranaceo vel byssoideo; systemate hyphali monomitico; hyphis distinctis, tenuitunicatis paulatim crassiusculis oleosis, fibulatis, in subiculo plerumque rectis, in subhymeno passim tortuosis; cystidiis nullis; basidiis clavatis vel suburniformibus, plus minusve constrictis, basibus plerumque biradicatis, saepe uncatis; sporis ellipsoideis vel obovatis, tenuitunicatis, non amyloideis.
Generitypus: *Uncobasidium luteolum* Hjortst. & Ryv.

Fruitbody resupinate, effused, softly membranous or byssoid. Hyphal system monomitic. The individual hyphae distinct, thin or becoming thickwalled, with clamp connections; subicular hyphae usually straight and of uniform diameter; subhymenial hyphae tortuous, in some cases strongly bent. Basidia (pleurobasidia) more or less suburniform, strongly constricted with a hook-shaped appendage, arising in the basal septum, with four sterigmata. Spores ellipsoid to obovate, thinwalled, non-amyloid.

UNCOBASIDIUM LUTEOLUM Hjortst. & Ryv. nov. sp.

Fructificatio semper resupinata, effusa, tenuis, hymenio luteolo, submembranaceo vel byssoideo; margine nusquam perspicuo; hyphis distinctis, tenuitunicatis oleosis, fibulatis, 2,5-4 um latis, in subiculo plus minusve rectiusculis, in subhymenio ubique tortuosis; cystidiis nullis; basidiis clavatis vel suburniformibus, tenuitunicatis, 30 - 50 x 8 um, constrictis, basibus biradicatis, 4 sterigmatibus sporis tenuitunicatis, ellipsoideis vel obovatis, circiter 9 x 6 um, interdum agglutinatis binatim, non amyloideis.

Holotypus: Norway. Troms, Målselv, Dividalen national park on Salix 1976-09-03, H.Solheim No. 1445 (O).

Fruitbody resupinate, effused, normally loosely attached to the substrate, subiculum paler than the fertile part, submembranous to byssoid, in colour usually yellowish, margin indistinct. Hyphal system monomitic, individual hyphae thin thinwalled, 2.5-4 um in diameter, with clamps and refractive oily contents. Basal hyphae straight and of uniform diameter up to 4 mu wide. Subhymenial hyphae 2.5-4 um in diam., more or less distinctly tortuous. Cystidia lacking. Basidia constricted, sinuous, mostly bi-rooted,with a more or less hook-shaped protuberance, with four sterigmata, 30-50 x 8 um. Spores ellipsoid to obovate, sometimes agglutinated in pairs, acyanophilous, nonamyloid and nondextrinoid.

Habitat: On decayed branches and trunks, probably only on deciduous trees.

Distribution: Known from three localities: Type locality (see above), Norway: Akershus, Bærum, Kjørbo, on deciduous wood, 1977-11-06, Nakken 2433 (O).
Sweden: Ångermanland, Junsele par., Åkerbränna nat. park in virgin forest, on Populus tremula, 1970-09-20, Hjortstam 4238 (GB).

The new genus is above all characterized by its unique basidia which typically have a lateral hook or loop extending from the basal part. This hook could be interpreted as a continuation of the basidia-bearing hyphae, but in most cases it seems that its growth has been terminated. However, true pleurobasidia as well as ordinary terminal ones, have been observed. Another remarkable character is the lack of a clamp at a point that normally would be assumed to be the base of the basidium. In most cases it is necessary to search a long distance along the lower hyphal part of the basidium before a clamp is observed. The oily hyphal contents, in shape of sphaerical drops and more irregular elongated bodies, are also a striking feature. Immature basidia have a very dense protoplasm but as the spores are shed they collapse and become completely hyaline.

The type collection is larger and better developed than Hjortstam's collection. In the latter the basidia are

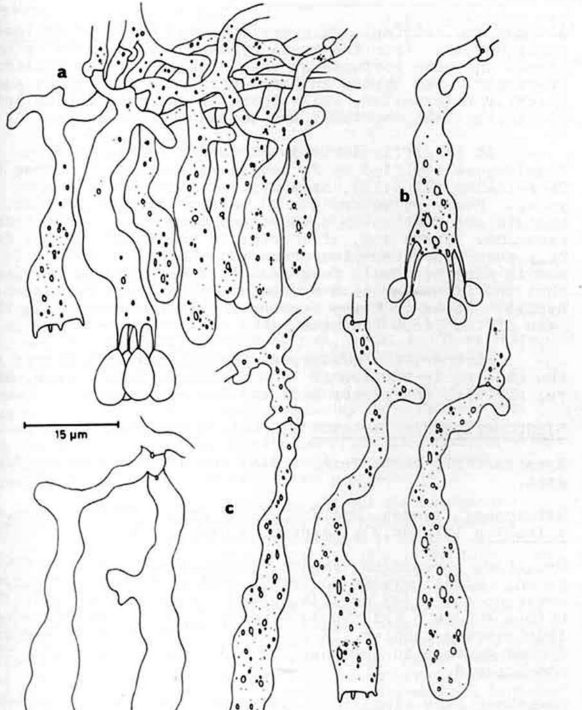

Fig. 1. *Uncobasidium luteolum*, a) section through the hymenium b) young basidium c) mature basidia d) hyphae e) spores. From the type except b: Coll. Hjortstam 4238. Drawing by L.Ryvarden.

younger and shorter. It seems that new basidia continuously develop from the basal hyphae and that they become longer and more tortuous as the thickness of the fruitbody increases. The hyphae in the subiculum are straight and slightly thickwalled, while those in the subhymenium are distinctly bent, tortuous and thinwalled.

It is difficult to point to any related genera. *Radulomyces* typified by *R. confluens* should, according to Oberwinkler (1965:13), have typical pleurobasidia when young. However, we could not confirm this observation. The basidia are distinctly clavate and develop a rather dense hymenium. There are, of course, in the margin of the fruitbody some scattered pleurobasidia. Their occurrence is common in many corticoid fungi and is attributed to the fact that the first basidium develops laterally on the advancing hyphae. Later ordinary terminal basidia develop from the base of the first basidium.

Further, in *Radulomyces* the basidia have clamps at the base as is the normal case in *Corticiaceae.* Thus, several basidial characters separate the two genera.

BYSSOCORTICIUM EFIBULATUM Hjortst. & Ryv. nov. sp.

Byssocorticio atrovirenti affini sed differt numquam fibuligero.

Holotypus: Sweden. Småland. Kärda par., Åminne on Fagus silvatica 1977-08,31, Hjortst. & Ginns. Hjm. 8685, (GB).

Fruitbody resupinate, smooth, somewhat byssoid, blueish-green. Hyphal system monomitic. Basal hyphae slightly encrusted, ab. 2,5-3 um wide, green coloured, subhymenial hyphae smooth. All hyphae without clamps. Basidia more or less clavate-tubular, 15-25 x 4-5 um with four sterigmata. Spores globose to somewhat obovoid, the wall becoming thick, non-amyloid.

Remarks: Very similar to *Byssocorticium atrovirens* (Fr.) Bond. & Sing. ex. Sing. both macroscopically and microscopically but well distinguished in lacking clamps at every septa.
Both *B. atrovirens* and the closely related *B. pulchrum*(Lund) Christ. have clamp at the base of the basidium and at almost all hyphal septa. However, on the basal hyphae there are some simple septa as well as clamps (cfr. fig. 77 in Eriksson & Ryvarden 1974:182).

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# SETOSPHAERIA MONOCERAS SP. NOV., ASCIGEROUS STATE OF EXSEROHILUM MONOCERAS

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Recently, *Cochliobolus* states were described for two *Drechslera* species with a non-protruding or 'flush' conidial hilum, *D. chloridis* Alcorn and *D. hawaiiensis* M.B. Ellis (Alcorn 1978). Conidial germination in both species is predominantly polar with basal germ tubes semiaxial, and the primary septum is more or less median in the young conidium (Alcorn, unpubl.). These characteristics would be accepted by some authors (Shoemaker 1959, 1966; Luttrell 1964) as sufficient to assign these two conidial forms to *Bipolaris*. The discovery of their ascal states therefore provides additional evidence supporting the hypothesis that future correlations identified will be *Drechslera-Pyrenophora, Bipolaris-Cochliobolus*, and *Exserohilum-Setosphaeria* (Luttrell 1977). A *Setosphaeria* state has been found for *E. monoceras* (Drechs.) Leonard & Suggs, and is reported in this paper.

Leonard and Suggs (1974) established the form-genus *Exserohilum* to segregate those species with protruding conidial hilum, which previously had been accommodated in *Bipolaris* (Shoemaker 1959) or *Drechslera* sens. lat. (Ellis 1971). The three known ascigerous states were transferred from *Trichometasphaeria* to the newly erected *Setosphaeria*, and one additional species described. Of the eight *Exserohilum* species accepted by Leonard and Suggs (1974), four were therefore not known to have ascal state connections. Subsequently Leonard (1976) described a *Setosphaeria* perfect state for *E. rostratum* (Drechs.) Leonard & Suggs emend. Leonard, and placed *E. halodes* (Drechs.) Leonard & Suggs into synonymy with the latter species. This left two species of *Exserohilum*, *E. monoceras* and *E. frumentaceum* (Mitra) Leonard & Suggs, with no known perfect states. The species are considered synonymous by Shoemaker (1959).

*Setosphaeria monoceras* sp. nov. Figures 1-4

Ascocarpi atrobrunnei vel atri, globosi ellipsoidei vel ovoidei, 300-500 µm alti, 260-400 µm lati, dense setosi. Setae atrobrunneae, rectae, multiseptatae, 45-240 µm longae, ad basim 6-15 µm diam., ad apicem 4-7.5 µm diam. Pseudoparaphyses filamentosae, hyalinae, septatae, ramosae 2.5 -6µm diam. Asci cylindrici vel clavati, bitunicati, 135-245 x 21-35 µm. Ascosporae 1-8, hyalinae, fusoideae vel oblongae, rectae vel curvae, 2-5-(plerumque 3-) septatae, ad septa constrictae, 45-75 x 11-20 µm, tunica tubulosa mucosa usque ad 120 µm longa ultra extremis projectis.

In foliis *Tritici aestivi* in agaro Sachii, 23.ii. 1978, J.L. Alcorn 7804b,BRIP 12567 holotypus, DAR 30601 isotypus.

Stat. conid. *Exserohilum monoceras* (Drechs.) Leonard & Suggs.

Ascocarps dark brown to black, globose to ellipsoidal or ovoid, 300-500 µm high, 260-400 µm diam; sometimes with a short broad beak up to 100 µm high, immersed, erumpent, or superficial on the substrate, uniloculate, densely setose especially on the upper half, fragile. Setae dark brown, paler towards apex, simple, straight, slightly tapered, multiseptate (1-7), basal cell sometimes swollen, 45-240 µm long, 6-15 µm diam. at base, 4-7.5 µm at the rounded apex, accompanied on many ascocarps by long tapering hyphae. Pseudoparaphyses filamentous, hyaline, septate, branched and anastomosing, generally not constricted at septa or only slightly so, cells 9-26 x 2.5-6 µm. Asci cylindrical to clavate, bitunicate, tapered at base, 1-8-(commonly 8-) spored, sometimes shortly pedicellate, 135-245 x 21-35 µm. Ascospores hyaline, fusoid to oblong, straight or mostly slightly curved, 2-5-(usually 3-) septate, constricted at septa, end cells hemispheric to hemiellipsoidal or almost oblong, central cells doliiform, 45-75 x 11-20 µm; with hyaline sheaths visible in water mounts, extending as long tapered cylindrical appendages from each extremity, 50-120 µm long, 7.5-12.5 µm diam. at the midpoint and 5-6 µm near the bluntly pointed tip.

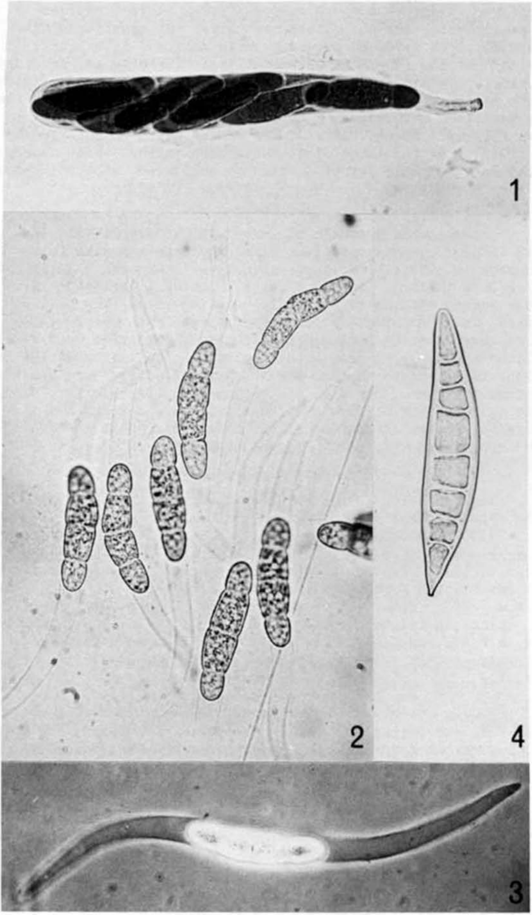
Holotype BRIP 12567 (isotype DAR 30601), from a pairing of single-ascospore cultures 77163-1 and 77163-5, on leaf sheaths of *Triticum aestivum* on modified Sach's agar. These two cultures have been lodged in the following collections: Commonwealth Mycological Institute (IMI 227131,227132), Centraalbureau voor Schimmelcultures (CBS 209.78,210.78), and the American Type Culture Collection (ATCC 36561,36562).

## The fungus in culture

Cultures were obtained from punctiform, purplish-brown leaf spots on *Echinochloa colona* (L.) Link (Biloela Research Station, Queensland, 13 April 1977, coll. M. Vincent). The conidial state on water agar + wheat straw has conidiophores up to 2.5 mm long (after 20 days), mid to dark brown, straight or flexuous, becoming geniculate with fertile nodes well spaced (often in excess of 100 µm apart) and slightly swollen. Conidia are pale to mid olivaceous brown, concolorous, fusoid, straight or curved, apex hemiellipsoidal, base obconic and truncate by a small protruding hilum of the 'plenum' type (Langdon and Gibbs 1971), 67-135 x 15-23 µm, 3-7 septate. These characteristics are sufficient to refer this fungus to *E. monoceras*. Comparison with the type specimen of *Helminthosporium monoceras* Drechs. from BPI (on *Echinochloa crus-galli* (L.) Beauv., Port Washington, N.Y., 20 Sept. 1920) supports the above conclusion concerning the specific identity of the conidial state.

Thirty single-lesion isolates were bulked and used to inoculate plates of Sach's agar supporting autoclaved maize leaf pieces. In addition a single isolate was cultured on water agar + wheat straw, exposed to near-ultraviolet light (12 h day) to stimulate conidial sporulation. Ascocarps developed on both media, but more abundantly on the wheat straw agar. A single ascocarp was crushed in a drop of water, the resulting ascospore suspension streaked over water agar, and single germinated ascospores transferred after 2 h incubation.

Single-ascospore cultures were grown individually and in all possible combinations in pairs, on modified Sach's agar (Leonard and Suggs 1974) supporting sterilized leaf material of maize, wheat,



Figures 1-4. *Setosphaeria monoceras*. 1. Ascus, in lacto-fuchsin 2. Ascospores, in water 3. Ascospore, in water, phase contrast 4. Conidium from single-ascospore culture on water agar + wheat straw (all approx. x400).

or *E. colona*. Single-ascospore cultures grown alone sometimes formed protothecia, but not mature ascocarps. Some paired single-ascospore cultures produced ascocarps with asci and ascospores, indicating that the fungus is heterothallic. The original development of ascocarps in a single culture derived from one lesion may indicate that both mating types were present in the lesion, and mixed in the primary isolate. Occurrence of both mating types of *C. heterostrophus* (Drechs.) Drechs. in a single lesion has been reported by Nelson (1957). Of the three plant substrates tested, wheat appeared to be the most suitable for production of ascocarps, especially leaf sheath from wheat straw.

## Discussion

*Setosphaeria* spp. are all very similar morphologically (Leonard 1976). Comparisons of original descriptions show that *S. monoceras* is most like *S. turcica* (Luttrell) Leonard & Suggs and *S. pedicellata* (Nelson) Leonard & Suggs. Conidial characteristics allow the latter species to be readily distinguished from *S. monoceras*. In *S. turcica*, ascocarps are larger than those of *S. monoceras*, but other morphological features appear to be very similar. It would be necessary to grow both species in parallel under the same conditions to ascertain whether the other small differences are real, rather than apparent. Conidial states are also very similar, especially in culture, but *E. turcicum* (Pass.) Leonard & Suggs has a more distinct change in contour of the basal cell where the 'inconspicuum' type hilum protrudes (Langdon and Gibbs 1971).

## Acknowledgement

I am grateful to the curator, herb. BPI, for lending the type specimen of *H. monoceras* Drechs.

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# *CLADOSPORIUM CASTELLANII* IS A SYNONYM OF *STENELLA ARAGUATA*

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## SUMMARY

Study of the type material of *Stenella araguata* Sydow and *Cladosporium castellanii* Borelli et Marcano, a recently described etiological agent of tinea nigra, has revealed that these two fungi are morphologically identical. *Cladosporium castellanii* is a synonym of *S. araguata*.

*Stenella araguata* was established in 1930 by Sydow to accommodate a phytopathogen of *Pithecolobium* found in Venezuela (4). Later, von Arx (1) transferred *S. araguata* to the genus *Cladosporium* as *C. araguatum*. In 1973, Borelli and Marcano (2) isolated a dematiaceous hyphomycete from a patient with tinea nigra in Venezuela. These authors considered their fungus to represent an undescribed taxon, and subsequently proposed the name *Cladosporium castellanii* (Figs. 1-2). Study of the type culture of *C. castellanii* (IMI 183818) and the syntypes of *S. araguata* (Herb. IMI 15728 and 34905) has revealed that these two fungi are conspecific. Thus, *C. castellanii* is a synonym of *S. araguata*.

*Stenella araguata* Sydow, Ann. Mycol. 28:205, 1930.
= *Cladosporium castellanii* Borelli et Marcano, Castellania 1:154, 1973.

≡ *Cladosporium araguatum* (Sydow) v. Arx, Gen. Fungi Sporul. Pure Culture, 2nd. ed., p. 224, 1974.

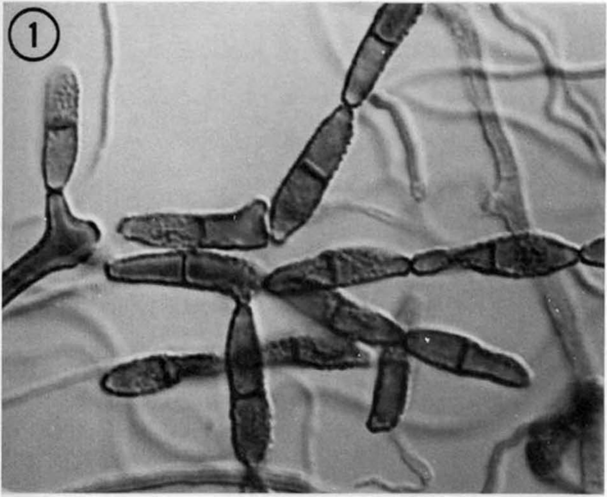
Colonies on Sabouraud dextrose agar and potato dextrose agar are slow growing, reaching a diameter of 10-12 mm in 2 weeks at 25°C and 4-6 mm at 37°C, velvety, mouse gray to olive green, with a central umbo and radiating grooves. The colony reverse is gray to black.

Conidiophores are micronematous to macronematous simple or branched, septate, pale brown to olivaceous brown. Conidiogenous cells are polyblastic, integrated, terminal or sympodial, straight or geniculate, often with a swollen apex, cicatrized, pale brown to olivaceous brown. Blastoconidia are cylindrical to obclavate, mostly cylindrical, catenulate, chains loosely branching, verruculose, trunicate, 0-4 septate, 1 septate predominant, light to olivaceous brown, 2.2-4.8 x 7.0-21.2 (average 3.3 x 12.3) µm.

*Stenella* is similar to *Cladosporium* Link, *Cercospora* Fres., and several other hyphomycetes. This genus can be readily distinguised from the other genera by its typically catenulate, cylindrical, septate, and usually verruculose blastoconidia that arise from simple or sympodial conidiogenous cells. Based upon the description and illustrations of *Biharia*, which was established for *B. vangueriae* by Thirumalachar and Mishra in 1953 (5), *Stenella* and *Biharia* are apparently congeneric (3).

It is beyond the scope of this study to determine whether or not *S. araguata* is an etiologic agent of tinea nigra. *Stenella araguata* is not an uncommon hyphomycete in Venezuela and could simply represent a skin contaminant that was isolated by Borelli and Marcano.

Figures 1-2. *Stenella araguata* (IMI 183818) in Nomarski differential interference contrast microscopy. Fig. 1. Sympodial conidiogenous cell with branching chains of conidia. Fig. 2. Conidia.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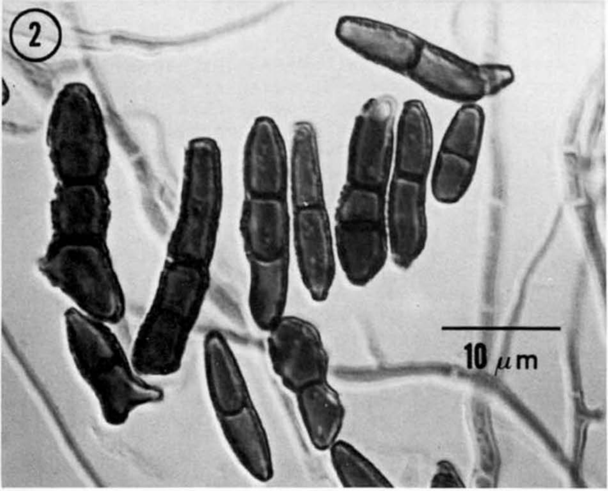
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## ACKNOWLEDGEMENTS

The authors wish to thank Dr. C.J.K. Wang for reviewing the manuscript and Dr. B.C. Sutton for loan of the herbarium specimens.

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# SEPTORIA EXOTICA

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*Scoleciasis atkinsonii* is reinstated as distinctive from *Septoria exotica*, and the two species are characterised in accordance with their types.

Two markedly distinctive pycnidial leaf spot pathogens occur in New Zealand and elsewhere on species of *Hebe*. Inexplicably these two species, *Septoria exotica* Speg. (1880) and *Scoleciasis atkinsonii* Syd. (1924) have been repeatedly confused (e.g. Grove, 1935; Brien & Dingley, 1955; Dingley, 1969). To resolve this confusion herbarium specimens in Herb. LEV and Herb. PDD were examined and cultures were prepared from fresh specimens collected at the Horticultural Reseach Centre, Levin. The two species differed in the appearance of the leaf spot, in the microscopic features of the conidia and in their growth in culture.

*Septoria exotica* forms small lesions mostly about 1-3 mm diam., with pale grey necrotic centre and sharply defined dark margin. The method of conidial formation is obscure but seems to be phialidic as in other typical *Septoria* species. The conidia are quite hyaline, apparently quite smooth, 20-30 µm long and 1 µm wide. In culture this species grows readily on agar, albeit slowly, and colonies develop to about 12 mm diam. in 7 days.

*Scoleciasis atkinsonii* forms larger lesions, 3-8 mm or more in diam., brown (not grey) in colour and less sharply defined with no distinctively coloured margin. The conidial formation is clearly annelidic and the conidia are distinctly coloured yellowish-brown, appear minutely roughened, 25-45 µm long and 2.5 µm wide. In culture the fungus grows hardly at all on agar and colonies are only 1-2 mm diam. in 7 days.

Conidia form in cultures of both species and retain the distinctive features of conidia formed in the host.

The type specimens of both species were examined *(Se. exotica* ex LPS 10595, *Veronica andersonii,* coll. C. Spegazzini, 18 July 1880; *Sc. atkinsonii* ex PDD 968, *V. atkinsonii,* coll. E.H. Atkinson, 24 Oct. 1920) and found to agree with the respective descriptions given above.

The type specimen of *Septoria veronicae* Rob. ex Desm. (ex PC, Desm. Crypt. Fr. 1710, *Veronica hederaefolia*) and another specimen (ex K, Rabenh. F. eur. 361, *V. triphylla*) were obtained and examined. As stated by Grove (1935) this differs in the character of the spot being rather pale and indistinct. The conidia are similar to those of *Se. exotica,* but to resolve the question of synonymy of this name, it will require isolations from fresh specimens of similar leaf spots on herbaceous *Veronica* species.

The type specimen of *Phyllosticta veronicae* Cooke (ex K, Fungi Brit. 615) was also obtained but the label carried a note "fide Townsend" that the host is *Viola hirta*.

Of the specimens received from the PDD herbarium, only two of those on *H. speciosa* (12201, 16373) and two on *H.* sp. (25234, 25455) agreed with *Se. exotica,* whilst three on *H. stricta* (86, 13245, 30382), two on *H. stricta* v. *atkinsonii* (968 type, 1590) and one on *H.* sp. (17393) agree with *Sc. atkinsonii*. All the others (*H. carnea* 12748; *H. gracillima* 21776; *H. marocarpa* 18446, 18596, 30002; *H. speciosa* 12618; *H. stricta* 13035, 25015, 25583; *H.* sp. 12692) except one, bore no pycnidia or sporulation, but instead epiphyllous corky lesions. This is a quite different symptom and there appears to be no evidence that these belong to either *Se. exotica* or *Sc. atkinsonii*. Thus they should be deleted from the New Zealand records (Dingley 1969) of *Se. exotica* until further studies can establish the cause of these symptoms. The one final specimen *(H. salicifolia* 1832) bear perithecia of uncertain identity; it too must be deleted from the New Zealand records of *Se. exotica*. No specimens of *H. elliptica* or *H. obtusata* were seen although recorded (Dingley, 1969) as hosts of *Se. exotica* in New Zealand.

The LEV specimens are as follows: *Se. exotica, H. andersonii (? salicifolia* x *speciosa)* 470; *H. franciscana* 'blue gem' (? *elliptica* x *speciosa)* 12864; *H.* sp. 466, 8687. *Sc. atkinsonii, H. stricta* 11962, 12743. Those on *H. andersonii* and *H. franciscana* are new records for New Zealand. From the few specimens available it appears that *Se. exotica* may be restricted to *H. speciosa* and its hybrids, whilst *Sc. atkinsonii* is restricted to *H. stricta* and *stricta* v. *atkinsonii*. Such specialization would also mean that *Se. veronicae* is unlikely to be the same species as *Se. exotica*.

The question of whether or not *Scoleciasis* is the appropriate genus for *Sc. atkinsonii* cannot be resolved at present as Dr B.C. Sutton advises (pers. comm.) that the type specimen has not been examined since its initial description. *Phaeoseptoria* might also be considered but Dr Sutton says he has not seen the type of this either.

I thank Dr Sutton and the curators of the herbaria mentioned.

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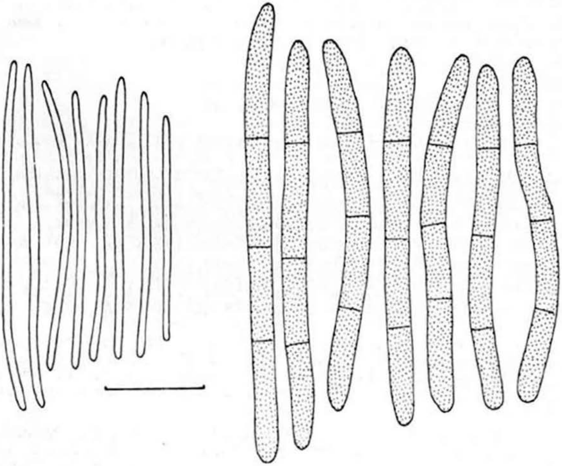

Fig. 1. Conidia from cultures of *Septoria exotica* (LEV 12864) and *Scoleciasis atkinsonii* (LEV 11962). Septa obscure. The scale is 10 µm.

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# THE CASE FOR UROMYCES TRIFOLII

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## SUMMARY

*Uromyces trifolii* (Hedw. f. ex DC.) Fckl is considered to be the most appropriate name for the microcyclic rust of white clover *(Trifolium repens* L.). *U. flectens* Lagerheim is reduced to synonymy. In the absence of its type specimen and because essential details of fungal morphology and host identity are not given in the original description, the name *U. nerviphilus* (Grognot) Hotson is rejected.

## INTRODUCTION

In a series of notes on several rust fungi, Laundon (1975) commented on various *Uromyces* spp. on *Trifolium* and concluded that the best name for the microcyclic telial rust of *Trifolium repens* L. is *Uromyces nerviphilus* (Grognot) Hotson (basionym: *Puccinia nerviphila* Grognot, 1863). The name *Uromyces trifolii* (Hedw. f. ex DC.) Fckl (basionym: *Puccinia trifolii* Hedw. f. ex DC., 1805) was rejected on the grounds that
(i) the type material is almost certainly heterogeneous and one cannot apply Recommendation 7B of the International Code of Botanical Nomenclature (Stafleu, 1972) to the name and thus it is to be rejected under Art. 70 and
(ii) it appears likely that the name has been used persistently in a different sense from that of the original material and in other different senses, and has become a long persistent source of error so is to be rejected under Art. 69.

As Laundon (1975) has pointed out, several authors dealing with the taxonomy and nomenclature of clover rusts have used the name *Uromyces trifolii* for rusts on several different species of *Trifolium*. In particular, the name has been used for the rust of red clover (*Trifolium pratense* L.), now called *Uromyces fallens* (Arthur) Barth. (Laundon, 1975), and for the macrocyclic rust of white clover *(T. repens)*, now called *U. trifolii-repentis* Liro. The two names most commonly used for the microcyclic telial rust of *T. repens* have been *Uromyces nerviphilus* (Grognot) Hotson (1925), based on *Puccinia nerviphila,* and *U. flectens* Lagerheim (1909). Laundon (1975) used the name *U. nerviphilus* for this rust and listed *U. flectens* as a synonym.

This note puts forward an alternative view, proposes a lectotype for *Puccinia trifolii* Hedw. f. ex DC. and suggests that the name *Uromyces trifolii* (Hedw. f. ex DC.) Fckl is the most suitable one to use for the telial rust of *T.repens*.

## DETAILS OF SPECIES

### *Uromyces trifolii*

The microcyclic rust was mentioned first by de Candolle, in Lamarck & de Candolle (1805),as *Puccinia trifolü* Hedw. f. Fung. ined. t.18. The following year it was listed with a brief description as *P. trifolii* by Lamarck & de Candolle (1806). Two years later, the name was transferred to *Uredo* as *U. trifolii* (Lamarck & Poiret, 1808) with reference to the basionym, *Puccinia trifolii.* In the *Flore Francaise* of 1815, de Candolle (1815) listed it as *Uredo trifolii,* with an explanation of why this and some other species were transferred from *Puccinia* to *Uredo.* Although it was listed under *Uromyces* by Léveillé (1847, 1848, from Laundon, 1967), he did not make the new combination in *Uromyces* (Laundon, 1967). This appears to have been done first by Fuckel (1870). All the authors mentioned assumed that this rust occurred on several species of *Trifolium* and, under the name *Uromyces trifolii,* Fuckel (1870) listed several spore stages for it. However, he did list *Uredo trifolii* DC.Fl.fr. VI, p.66 specifically as the 'Fungus teleutosporiferus' indicating that he realised that de Candolle's name referred to a telial rust.

In his original description, de Candolle, in Lamarck & de Candolle (1805) described the rust on stems, petioles and leaf veins. He mentioned that it curled, enlarged and disfigured the organs attacked, and that the clover could be prevented from flowering. The sori were described as oblong to irregular, surrounded by the torn epidermis and containing a reddish-brown spore mass, made up of ovoid, very shortly pedicellate spores. It was found in a shaded meadow near Fontenai-aux-Roses, and was said to occur on three *Trifolium* spp., *T. repens, T. filiforme* and *T.hybridum*.

The original material of *Puccinia trifolii* from de Candolle's collections at Geneva has been examined. As Laundon (1975) stated, it consisted of three sheets which were thought at first to represent the three *Trifolium* spp. listed by de Candolle, in Lamarck & de Candolle (1805). An identical telial rust was present on all three sheets. No other spore stage was seen. Sheet 1 was labelled '*Puccinia trifolii* in trifolio repente, Fontenay aux Roses' and Dr. C.E.B. Bonner (Herb. G) indicated that the words 'Fontenay aux Roses' are in A.P. de Candolle's handwriting (Fig.1a,c)..

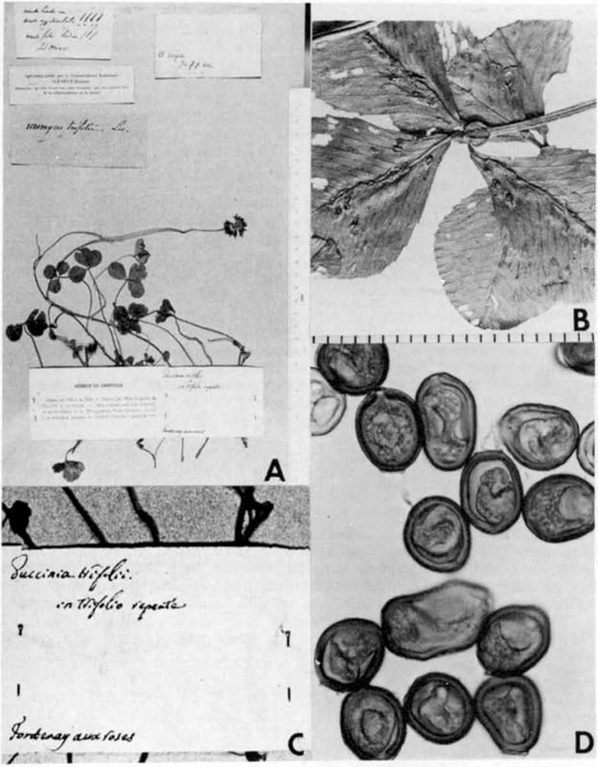


Fig.1. *Uromyces trifolii*, lectotype in G. (a) Sheet 1 showing specimen and notes; scale in mms (b) close-up showing telia; scale in mms (c) label on sheet enlarged to show names of rust, host and locality (d) Teliospores x 590 (slide as DAR 28120).

Sheet 1 also has the annotation '*Uromyces trifolii* Lev. and the words '*Uromyces trifolii*' are in Fuckel's handwriting (Dr. C.E.B. Bonner, *in lit.*). From the annotations, Sheet 1 appears to be part of the original collection of *P. trifolii*. On Sheets 2 and 3 there is no indication given of either host or locality, but on vegetative characters the plants appear to be *T. repens* (and not either of the other two *Trifolium* spp. mentioned by de Candolle). On Sheet 3, the words '*Puccinia trifolii* fl.fr.604 *Uredo* ------DC.' are written in de Candolle's hand (Dr.C.E.B. Bonner, *in lit.*) and there is a sketch of two oval shortly pedicellate unicellular spores on which is written the letter 'H' and the note 'Sporae globoso - ovata vel ovata [glabrissima?] pedicello brevi instructa' (square brackets and question mark mine). The author of the sketch and its annotations is not known.

No other de Candolle material under the names *Puccinia trifolii* or *Uredo trifolii* could be found at Geneva (Dr. Bonner, *in lit.*). Enquiries were made at several other herbaria, and at Leiden, a specimen labelled '*Uredo trifolii*'in de Candolle's handwriting was found in Persoon's herbarium. Examination has shown this to be a microcyclic telial rust identical with the Geneva material. The specimen had been examined by Dr. I. Jørstad in 1956, recognised as the telial rust and annotated by him as *Uromyces nerviphilus* (Grog.) Hots. No indication of the host was given but in size, shape and markings, the four leaves present were similar to those of *T. repens*.

In PC, one sheet labelled '*Uredo trifolii*' (but with no other information) was found. This bore a telial rust identical with that seen in the Geneva and Leiden specimens. The author of the handwritten annotation on this sheet could not be determined either at PC or G (Madame J.Nicot, *in lit.*).

Although Laundon (1975) states that the type material of *Puccinia trifolii* is almost certainly heterogeneous, the present investigation indicates that all available de Candolle material of this rust in G and L is perfectly homogeneous, the same microcyclic rust being present in all cases. As far as the host plants are concerned, floral and vegetative features show that Sheet 1 in G is definitely *T.repens*. All other available sheets appear to be *T. repens* as far as can be determined from vegetative material. Although de Candolle listed both *T.filiforme* and *T.hybridum* (in addition to *T.repens*) as hosts of *P.trifolii*, no material of rust on these two species could be found in his collections and perhaps specimens of rust on these hosts were not collected. The α, β and γ notation under which the three *Trifolium* spp. were listed originally does not refer necessarily to specimens but could be merely de Candolle's way of listing the hosts on which he saw the rusts (Dr. Bonner, *in lit.*). As Laundon (1975) has pointed out, *T. filiforme* and *T. hybridum* are hosts of other rust species.

It is thus possible to select a lectotype for *Puccinia trifolii* Hedw. f. ex DC. from the original material and Sheet 1 (Fig.1a), being that sheet in G bearing the specimen marked '*Puccinia trifolii* in trifolio repente' and the locality 'Fontenay aux Roses' is chosen. This sheet carries de Candolle's handwriting, agrees with the original description, locality and one of the three hosts originally listed.

*Uromyces nerviphilus*

*U. nerviphilus* was described originally as *Puccinia nerviphila* Grognot (1863) as follows:-

> "54 - Puccinie des nervures. *P. nerviphila,* n. Sur les deux faces, mais principalement sur la face inférieure des feuilles des trèfles; automne, hiver. R. (Ressemble un peu à la puccinie du vératre (*P.veratri,* Dub.), mais elle affecte la forme allongée de la puccinie du roseau, surtout de sa variété épiphylle, Wallr., elle est cependant d'un brun moins foncé et accompagnée très longtemps de l'épiderme comme dans la puccinie du chardon roland; ce qui distingue principalement, c'est qu'elle suit constamment la nervure principale.)"

In this description, Grognot compared his rust with three other rusts. He said that it slightly resembled *Puccinia veratri* Dub., which occurs on the lower leaf surface of *Veratrum* spp., and has small round or elongated uredinia and similar brown telia (Gäumann,1959,p.864). He said also that his rust had the elongated shape of the reed *Puccinia*, especially of the variety epiphylle Wallr. This refers to *Puccinia arundinacea* Hedw. f.α *epiphylla* Wallroth (1833,p.225), which is probably the same as *P.phragmitis* (Schum.) Korn. or *P.magnusiana* Korn. In both these rusts, and especially in *P. phragmitis*, the sori are often elongated up to several millimetres along the leaf (Gäumann 1959,pp.713,747; Wilson & Henderson, 1966). The telia in these reed rusts are very dark brown to black and Grognot wrote that the sori of his rust were less dark brown than the sori of var. *epiphylla* Wallr. He wrote also that the sori in his species were accompanied for a long time by the host epidermis, and he compared this with 'la puccinie du chardon roland'. This is the rust *Puccinia eryngii* DC.on *Eryngium* spp., whose sori are long surrounded by the host epidermis (Gäumann, 1959, p. 986).

In summary, Grognot's description indicates a mainly hypophyllous rust, with sori on the main vein of the leaf, brown in colour, long accompanied by the host epidermis, and occurring on unspecified clovers.

This limited description does not conflict with what is known of the symptoms produced by the microcyclic telial rust of *T. repens* but no details of the clovers attacked are given nor is there any description of the fungus itself, apart from the colour and arrangement of the sori. It was listed by de Toni (1888) as *Puccinia neurophila* Grognot, with a brief latin summary of Grognot's description and the comment 'species maxime dubia'. It was transferred to *Pucciniola* by Arthur (1921) and to *Uromyces* by Hotson (1925), but neither of these authors listed other than American specimens examined. Both also attributed pycnia and aecia to this rust as well as telia, although Grognot's description does not indicate that he saw two distinct types of sorus. As Laundon (1975) has pointed out, later authors have varied in their treatment of this species, some attributing to it only telia, and others pycnia, aecia and telia.

Detailed attempts to locate the type specimen of *P.nerviphila* Grognot have been unsuccessful. It could not be found amongst the Grognot collections at Autun (AUT) and the Director, M.G. Pacaud, wrote that the specimens corresponding to Grognot's (1863) descriptions in *Plantes Cryptogames-Cellulaires du Département de Saone-et-Loire* are not there. He said that the herbarium collected by Grognot was sent in 1875 to C. Roumeguere. A search for the specimens in herbaria at Paris (P, PC), Montpellier (MPA, MPU), Brussells (BR) and Kew (K) has failed to locate them and the Directors of these herbaria are unable to suggest a possible location for them. They are not amongst the Roumeguere collections at PC. Enquiries in progress at Bordeaux and Rouen have not found them so far. It is of interest that former workers on clover rusts make no mention of having seen the type of *P. nerviphila* Grognot.

As the identity of *P. nerviphila* cannot at present be clarified from an original collection and as the description is insufficient to indicate precisely the identity of both the fungus and its hosts, it is suggested that the name *Uromyces nerviphilus* (Grognot) Hotson (based on *Puccinia nerviphila* Grognot) cannot be used with certainty for any species of clover rust.

### *Uromyces flectens*

*U.flectens* Lagerheim (1909) was described on *T. repens* from a collection made at Fjallbacka, Hyppeln, in the Bohuslän region of Sweden. The mainly hypophyllous large, bullate telia were especially common on veins and petioles and the teliospores were described as not distinct from those of *U. trifolii-repentis* Liro.

It has not been possible to locate the type collection from Bohuslän. It is not amongst Lagerheim's collections at S but three other collections made in Sweden and signed 'G. Lagerheim' have been seen from S. A duplicate of one of these (Stockholm, August 1909) from PC has also been examined. The fungus in all collections agrees with the original description and is identical with that seen in the de Candolle specimens of *U. trifolii*. *U.flectens* Lagerheim is thus considered to be a synonym of *U.trifolii* (Hedw. f. ex DC.) Fckl. As Lagerheim's Bohuslän collection could not be found, the specimen from Stockholm, August, 1909 (in S) is chosen as neotype of *U. flectens* Lagerheim.

## USE OF NAMES IN DIFFERENT SENSES

As stated above, Laundon (1975) pointed out that there is no doubt that the name *Uromyces trifolii* has been used in different senses for what are now known to be different species of clover rusts. However, the position with all the names used for rusts on *T.repens* has been confused, and Laundon (1975) also cited examples of usage in different senses for the names *U.nerviphilus* and *U.flectens*.A check of several texts dealing with rusts supported this (Arthur 1912, 1921, 1934; Sydow and Sydow, 1909-1910; Cunningham, 1931; Guyot, 1957; Gäumann, 1959; Wilson and Henderson, 1966).

With *U.trifolii*, some of the confusion dates back to the original description, where three *Trifolium* spp., now known to be hosts of different rusts, were listed (Lamarck & de Candolle, 1805; Laundon, 1975). Fuckel annotated one of de Candolle's specimens as *'Uromyces trifolii'* and probably recognised it as a telial rust, especially as he used the name *'Uredo trifolii* DC.' specifically for the telial stage of *Uromyces trifolii* (Fuckel, 1870). However, he also adopted a more general species concept for this name, and in *Symbolae Mycologicae* he lists rusts on *Trifolium, Medicago, Anthyllis, Onobrychis* and *Lotus* under *Uromyces trifolii*. Three of the exsiccati he listed for these rusts have been examined and all are what are now recognised as distinct species on these hosts (see 'Notes on other specimens' below). Later texts have continued to apply the name *U.trifolii* to various rusts on several *Trifolium* spp.

With *U.nerviphilus* and *U.flectens*, the various uses of the names have been due at least partly to an earlier lack of knowledge of the life cycles of the clover rusts. In some cases, mixed infections with *U. trifolii-repentis* Liro have probably been responsible for confusion (Jørstad, 1967). Moreover, as Laundon (1975) has pointed out, some authors, following Arthur (1921), attributed aecia to these rusts, and listed *U.flectens* as a synonym of *U.nerviphilus*. Sydow and Sydow (1909-1910) and Grove (1913) used the name *U.flectens* for the microcyclic rust and listed *Puccinia nerviphila* Grognot (in Grove (1913) as *P.neurophila* de Toni in Sacc.) as a synonym. Gäumann (1959) treated *U.nerviphilus* as a demicyclic rust and *U.flectens* as microcyclic. As Laundon (1975) has stated "The name *U.nerviphilus* has been the subject of some confusion and error" and ".....that name *(U.flectens)* was equally confused by Arthur (1921, 1934) and others......".

It thus seems that all names available for the microcyclic rust of *T.repens* have been used to varying degrees in different senses. Under these circumstances, any confusion is not resolved satisfactorily by choosing a name such as *U. nerviphilus* whose original host species is not known and which, in the absence of its type specimen and the paucity of its original description, cannot be properly typified and soundly established. On the other hand, type material of *U. trifolii* and authentic material of *U. flectens* is available and examination of this has shown that they are identical. The descriptions of both are in accord with the fungus present on the specimens, the identity of the host and the symptoms shown. The lectotypification of the earlier described *U. trifolii* establishes the identity of this species on a sound basis and the later described *U. flectens* can be reduced to synonymy.

With regard to the name *U. trifolii*, it is not felt that confusion in the taxonomic literature, even when this is followed to some extent in works on plant pathology, is sufficient reason for rejecting it. It is exactly in the taxonomic literature that one expects diverse opinions to be put forward in an effort to reach a solution. Plant pathological literature has dealt comparatively little with clover rusts and then authors have tended to follow the nearest available taxonomic opinion.

Of the three names available, *Uromyces trifolii* (Hedw. f. ex DC.) Fckl is the earliest and can be accurately lectotypified. The later described *U. flectens* is identical with it. The third name, *U. nerviphilus*, is less precisely described with regard to both fungus and host than the other two, type or authentic specimens cannot be found, and it seems to be the least suitable of the three names to choose within the framework of the International Rules.

## CONCLUSIONS

The following nomenclature is proposed for the microcyclic rust of *T. repens*:-

*Uromyces trifolii* (Hedw. f. ex DC.) Fckl, *Symb. Myc.* p. 63, 1870.
    ≡ *Puccinia trifolii* Hedw. f. ex DC., *Fl. fr.* 2: 225, 1805
    ≡ *Uredo trifolii* (Hedw. f. ex DC.) DC. in Lamarck & Poiret, *Encycl. meth. Bot.* 8: 223, 1808 (also in *Fl. fr.* 6: 66, 1815)
    ≡ *Nigredo trifolii* (Hedw. f.) Arthur, *Result. Sci. Congr. Bot. Vienne* 344, 1906 (from Arthur, 1912)
    = *Uromyces flectens* Lagerheim, *Svensk. Bot. Tidskr.* 3: 36-38, 1909.

Telia only present on leaf blades, petioles and pedicel of inflorescence, reddish-brown, raised, at first covered by the epidermis, later powdery with exposed spores and surrounded by torn epidermal fragments, scattered on both surfaces of leaf but usually larger and more numerous on lower surface, often confluent along the mid-vein, also often abundant and confluent on the petiole below the junction of the three leaflets (Fig. 1b), often associated with twisting and distortion, 0.5-1 mm diam., up to 3 x 1 mm on petioles and pedicels. Teliospores (Figs. 1d, 2, 3) golden brown to pale reddish brown, sub-globose, oval, obovate or elongated oval to slightly irregular, a few ovate, unicellular, (18) 22-31 (33) x (15) 17-21 (24) µm, wall apparently double, composed of a very thin hyaline outer

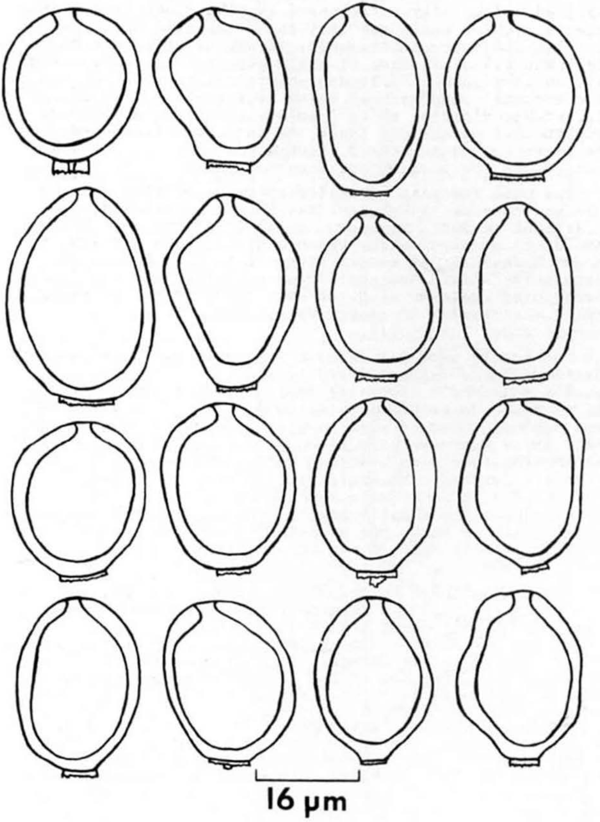


Fig.2. *Uromyces trifolii:* teliospores from sheets in G. From top, four spores each from Sheet 1 (lectotype, slide as DAR 28120), Sheet 2 (upper specimen, slide as DAR 28121), Sheet 2 (lower specimen, slide as DAR 28122), Sheet 3 (slide as DAR 28123).

wall less than 0.5 μm thick and a golden brown inner wall 2-2.5 μm thick, pierced at the apex by a germ pore 2-2.5 μm wide over which the outer wall forms a shallow hyaline papilla. Teliospores attached to stalk at hilum 6.5-9 μm wide with a short length of stalk usually remaining attached to mature spores. Teliospore wall finely roughened (Fig. 3) with small round-topped warts less than 1 μm high and of variable diameter up to 1 μm arranged in a few broken longitudinal or oblique lines, or as curved lines across the spore, or as scattered patches, in some spores more than 50% of the area of one face roughened.

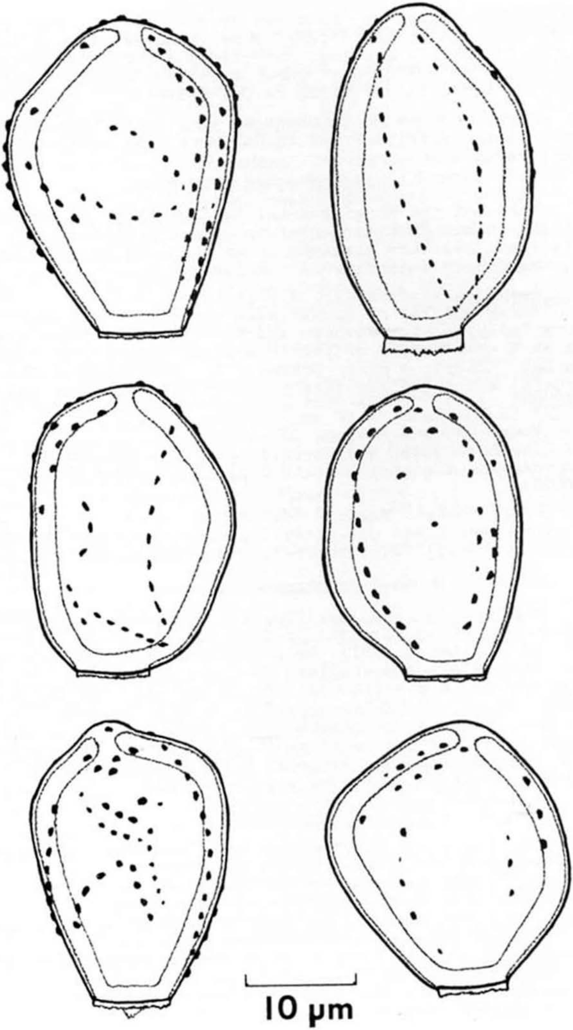
The name *Uromyces nerviphilus* (Grognot) Hotson (syns. *Puccinia nerviphila* Grognot, *Puccinia neurophila* Grognot in de Toni in Sacc., *Pucciniola nerviphila* (Grognot) Arthur) should not be used as the absence of its type and the original description do not allow it to be characterised accurately. Should Grognot's type be found, and his species shown to be the same as *U.trifolii* (Hedw. f. ex DC.) Fckl, then *U.nerviphilus* (Grognot) Hotson would be reduced to synonymy under *U.trifolii*.

The name *U.trifolii* (Alb. & Schw.) Winter in Rabh. (1884) (basionym *Uredo fabae* β *trifolii* Alb. & Schw. 1805) is a later homonym of *U. trifolii* (Hedw. f. ex DC.) Fckl (1870). The rust was described originally on *T.repens* and the name has been used by some authors (Plowright, 1889; Migula, 1925) for a macrocyclic rust on *Trifolium* spp.. The type specimen has not been examined during the present study. Hylander, Jørstad & Nannfeldt (1953) list *Uredo fabae* β *trifolii* Alb. & Schw. as a synonym of *Uromyces trifolii-repentis* Liro (as'(Cast.) Liro'). The sub-specific epithet *trifolii* Alb. & Schw. has no priority over the specific epithet *trifolii* Hedw. f. ex DC. published in the same year (Art.60).

Specimens examined: On *Trifolium repens:* labelled '*Puccinia trifolii* in trifolio repente Fontenay aux Roses', no other data given, Sheet 1 in G (lectotype of *U.trifolii*) (slides as DAR 28120); Stockholm, August 1909, G. Lagerheim, neotype of *U.flectens* Lagerh., in S (slides as DAR 30663), duplicate in PC (slides as DAR 28329); Borgholm, Sweden, 1908, G. Lagerheim as *U.flectens*, in S (slide as DAR 30664); Fjallnas, Sweden, 1897, G. Lagerheim, in S det. I.Jørstad as *U.flectens* (slide as DAR 30665).

On *Trifolium* sp., probably *T.repens* on vegetative characters; no data on Sheet 2 in G (slides as DAR 28121,

Fig.3. *Uromyces trifolii*: teliospores ex lectotype in G showing wall thickness, apical pore and distribution of surface markings (slide as DAR 28120).


10 μm

DAR 28122); labelled '*Puccinia trifolii* fl.fr. 604' Sheet 3 in G (slide as DAR 28123); sheet labelled '*Uredo trifolii*' in de Candolle's writing, in Persoon's Herb. in L 910,264-22 (slide as DAR 27047); sheet labelled '*Uredo trifolii*' in unknown hand, in PC (slide as DAR 28078).

Several other collections of *U.trifolii* from Australia and other countries filed in DAR were also examined during this work.

## NOTES ON OTHER SPECIMENS

Three of the Fungi Rhenani Exsiccati listed by Fuckel (1870) in his description of *Uromyces trifolii* were examined. All were received under the name *Uromyces trifolii* but have been determined as follows:

1. *Fungi Rhenani Exsicc.* 388 ex L
Three species of clover were present on the sheet.They were *T.repens*, *T. montanum* and *T.medium*. The rusts present in each case were *U.trifolii-repentis* Liro II, III (slide as DAR 27049a), *U.minor* Schroet. I, III (slide as DAR 27049b) and *U.fallens* (Arth.) Barth. II (slide as DAR 27049c).

2. *Fungi Rhenani Exsicc.* 389 ex L
The host plant was *Onobrychis sativa* and the rust present was *U.onobrychidis* Bub.II, III (slide as DAR 27050).

3. *Fungi Rhenani Exsicc.* 391 ex L
The host plant was *Anthyllis vulneraria* and the rust present *U.anthyllidis* Schroet. II (slide as DAR 27051).

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# REVUE DES LIVRES

par

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Belgique

COELOMYCETES VI. NOMENCLATURE OF GENERIC NAMES PROPOSED FOR COELOMYCETES, par B. C. Sutton, Mycological Papers n° 141, 253 p., in 8°, 1977. Commonwealth Mycological Institute, Kew, Surrey, UK. Prix £ 7.5o, étranger £ 9.oo, $ 16.2o.

Malgré les progrès réalisés ces dernières années dans la systématique des Coelomycetes, il est certain que la confusion et le statut mal défini de nombreux noms de genre rendent le travail taxonomique fort ardu. C'est pourquoi, l'auteur, en spécialiste du groupe, corrige cette situation en analysant, sur la base de 500 ouvrages consultés, le contenu taxonomique et le statut nomenclatural de 1336 noms de genres de champignons à pycnides et à acervules et de 149 noms de genres de Pycnothyriales. Près d'une moitié de ces noms est, après analyse, à rejeter et un quart des noms est accepté tandis qu'un autre quart reste à évaluer.

THE BLACK YEAST AND ALLIED HYPHOMYCETES, par G. S. de HOOG et E. J. HERMANIDES-NIJHOF, Studies in Mycology n° 15, 223 p., 97 figs., 1 pl., in 8°, 1977. Centraalbureau voor Schimmelcultures, Baarn, Nederland. Prix Hfl 50.-, ann. subscr. Hfl 50.-

Cette publication est un ensemble cohérent de trois articles: *Rhinocladiella* and allied genera, *Aureobasidium* and allied genera, et Survey of black yeasts and allied genera.

Dans le premier article, de Hoog analyse ses observations de 37 espèces et 5 variétés appartenant finalement à 9 genres distincts, suivant les méthodes traditionnelles de taxonomie, et les méthodes modernes de taximétrie et de spectrographie de masse après pyrolyse. Il développe ainsi une méthodique nouvelle pour l'appréciation de l'importance des caractères. Il décrit 2 genres et 7 espèces nouvelles. E. J. Hermanides-Nijhof décrit 14 espèces d'*Aureobasidium* (syn. *Pullularia* et *Kabatiella*) et 4 espèces d'*Hormonema*, ainsi que *Sarcinomyces crustaceus* Lindner. Dans une revision des "levures noires", les auteurs examinent le statut de 46 genres et 242 espèces. Cet ouvrage s'avèrera d'une grande importance dans la taxonomie de ce groupe si confus de champignons levuriformes.

IDENTIFICATION OF WOOD-INHABITING APHYLLOPHORALES IN PURE CULTURE, par J. A. STALPERS, Studies in Mycology n° 16, 248 p., 7 figs., 2 pls., in 8°, 1978. Centraalbureau voor Schimmelcultures, Baarn, Nederland. Prix Hfl 50.-.

L'étude de 96 caractères sur 1500 cultures de 550 espèces de basidiomycètes lignicoles de l'ordre des Aphyllophorales a permis à l'auteur de construire une clé dichotomique d'identification. Celle-ci est conçue sur le modèle de celle de Nobles (1965), mais la dépasse par le nombre de caractères et le nombre des espèces. La clé est à la fois descriptive et diagnostique; elle est rapidement divisée en 7 clés secondaires et occupe la plus grande partie de l'ouvrage (190 pages). Chaque espèce, à laquelle aboutit la clé, est accompagnée d'un code qui reprend les indices des caractères de l'espèce et qui, groupé à d'autres, aurait pu constituer une clé synoptique. L'ouvrage veut être un outil pour l'identification des cultures d'Aphyllophorales, et est excellent quant au fond. Cependant quelques améliorations de détails eut rendu l'outil plus maniable: l'indication de la lettre de référence de chacune des sept clés dans la numérotation de leur dichotomie respective, l'addition d'un index taxonomique des espèces, le soulignement de la référence principale de l'espèce dans l'index alphabétique et enfin la construction d'une clé synoptique qui eut été plus brève. Mais l'utilisateur peut aisément apporter ces améliorations à cet outil dont la valeur est d'ailleurs indéniable.

BIOLOGICAL NOMENCLATURE, par Charles JEFFREY, 2e édition, 72 p., 3 tabl., in 8°, 1977. Publication of the Systematics Association, Edward Arnold Ltd, 15 Hill Street, London W1X 811. Prix £ 1.95 (souple) 4,75 (cartonné).

Ce petit guide a pour but d'introduire le biologiste, qu'il soit mycologue, bactériologue, botaniste ou zoologiste, à la pratique de la dénomination des êtres vivants en accord avec les divers codes de nomenclature. Basé sur des définitions claires, ce guide fait bien la différence entre taxonomie et nomenclature. Dans la description de la démarche nomenclaturale, il distingue clairement les cinq "filtrages" successifs, assurés par les règles de nomenclature, des noms donnés à un même organisme pour aboutir au seul nom correct: la publication, la formulation, la typification, la légitimité et la priorité. Les divers codes de nomenclature n'étant pas identiques, leurs différences sont mises en évidence. D'un prix très abordable, ce livre est à recommander à tout étudiant en biologie.

THE BIOLOGY OF SYMBIOTIC FUNGI, par Roderic COOKE, 282 p., 75 figs. in 8°, cartonné, 1977. John Wiley & Sons Ltd, Baffins Lane, Chichester, Sussex, UK. Prix £ 10.75, $ 21.oo.

Le concept de symbiose, habituellement réservé à une association à profit mutuel entre organismes vivants, est ici étendu à ces relations vitales où aucun partenaire ne tire de bénéfice apparent de l'association et même à ces relations où un des organismes tire tout son bénéfice aux dépends de l'autre. De nombreux exemples sont analysés pour illustrer chacun de ces types de symbiose: symbiose mutuelle, symbiose neutre et symbiose antagoniste, exemples dans lesquels le partenaire du champignon peut être soit un animal, soit une plante supérieure, soit une algue, soit encore un champignon. En chaque cas, les facteurs écologiques, les phénomènes physiologiques, les pertes et profits pour chaque partenaire sont analysés et abondamment documentés.

TERMITES ET CHAMPIGNONS, LES CHAMPIGNONS TERMITOPHILES D'AFRIQUE NOIRE ET D'ASIE MERIDIONALE, par Roger HEIM, 208 p., 56 figs, 7 pls. col. fors texte, in 8°, cartonné, 1977. Boubée Ed., 11, Place Saint Michel, 75006 Paris. Prix FF 160.-.

Dans ce magnifique volume illustré, le Professeur Heim nous présente ses trente années d'observations sur les champignons termitophiles qui l'ont mené d'Afrique noire et de Madagascar à l'Asie méridionale (Inde, Orissa et Bihar). L'ouvrage est plus qu'un regroupement des multiples travaux de l'auteur publiés antérieurement. L'auteur y apporte des idées nouvelles, revoit la position de certaines espèces et de certaines formes et ajoute deux espèces nouvelles, *Termitomyces spiniformis* et *T. lanatus*. Les *Termitomyces* ont sans doute des affinités avec des genres non-termitophiles ni cavernicoles, mais ils ont surtout des caractères qui en font un genre bien défini, la mycotête, la meule, les pseudorhizes et le perforatorium. Des 14 espèces qui font la section des *Eu-Termitomyces*, l'auteur sépare 3 espèces et leurs formes dans une section des *Prae-Termitomyces, T. microcarpus, T. medius et T. perforans*, qui représenteraient divers stades d'une différenciation lamarckienne des champignons termitophiles. Aux nids des termites, sont encore associés des Ascomycètes sur les meules, une Phallale nouvelle dans les chambres, des Agaricales, des Bolétales, des Gastérales et des Aphyllophorales sur les revêtements extérieurs, desquelles cinq espèces sont nouvelles. L'ouvrage n'est pas que descriptif. Il reflète très bien le souci du Professeur Heim de comprendre l'intrigant mystère que recèle la morphologie et la biologie de ces *Termitomyces*.

THE NEMATODE-DESTROYING FUNGI, par G. L. BARRON, Topics in Mycobiology n° 1, 140 p., 57 figs, in 8°, 1977. Canadian Biological Publications Ltd, Box 214, Guelph, Ont. N1H 6J9 Canada. Prix US $ 12.5o frais compris.

Abondamment illustré de plus de 70 microphotographies et de nombreux dessins, ce livre, conçu comme une introduction à la biologie des champignons prédateurs et parasites des nématodes est en fait le premier livre traitant ce sujet comme tel et est très réussi. Des champignons prédateurs, l'auteur décrit la structure et le fonctionnement des organes de capture, réseaux, boutons, anneaux et autres. D'autre part il explore les mécanismes d'infection des nématodes par les champignons parasites, par adhésion, ingestion ou injection. Enfin il analyse les moyens de dissémination et la production de substances attractives et de poisons nématocides qui font de ces champignons un ennemi redoutable des nématodes.

LICHENOLOGY IN THE BRITISH ISLES, 1568-1975, AN HISTORICAL AND BIBLIOGRAPHICAL SURVEY, par D. L. HAWKSWORTH et M. R. D. SEAWARD, 231 p., 22 figs., 17 figs. hors texte, in 8°, cartonné, 1977. The Richmond Publ. Co., Orchard Road, Richmond, Surrey, England TW9 4PD, Prix £ 23.10.

Quatre siècles d'histoire de la lichénologie britannique sont ici condensés, grâce à l'habileté et la science des auteurs, en un texte de 40 pages détaillé et précis. Mais le but du livre est de présenter une bibliographie complète sur les lichens décrits et recensés en Grande-Bretagne. Il fallut dix ans de travail et de persévérance aux auteurs pour retrouver et dépouiller les 2695 ouvrages qu'ils ont recensés. De plus, les références aux flores localesont été compilées comté par comté. A cette bibliographie, les auteurs ont ajouté une liste des 65 herbiers conservant des lichens de Grande-Bretagne, une liste des récolteurs et une illustration des étiquettes représentatives des divers exsiccatae. Cet ouvrage, sans aucun doute, répondra aux voeux des lichénologues.

ANNOTATED INDEX TO FUNGI DESCRIBED BY N. PATOUILLARD, par Donald H. PFISTER. Contribution of Reed Herbarium n° 25, 211 p., in 8°, 1977. Ed. C.F. Reed, 10105 Harford Road, Baltimore MD 21236, USA. Prix $ 5.oo.

Afin d'aménager l'accès aux 50.000 spécimens de l'herbier de Narcisse Théophile Patouillard, acquis en 1927 par le Farlow Herbarium of Cryptogamic Botany, de l'Université Harvard, le Dr Pfister s'est imposé la courageuse tâche d'établir la liste des 111 genres et des 1900 espèces publiées par Patouillard, avec référence au protologue original, mention de l'habitat et de la localité type, avec référence aux spécimens d'herbier et référence à Saccardo avec mention éventuelle de changements nomenclaturaux par ce dernier. L'auteur fort heureusement rappelle dans son introduction que cette oeuvre immense du mycologue français prend toute sa valeur si l'on sait que Patouillard fut un des promoteurs de l'examen des structures anatomiques en vue de la distinction des espèces.

CHECK LISTE OVER DANMARKS HATSVAMPE, par Henning KNUDSEN, 63 p., in 12°, 1977. Publ. Foreningen til Svampekundskabens Fremme, Thorvaldsensvej 40, 1871 København V, Danemark. Prix DKr 15.-.

Liste de toutes les Agaricales récoltées, publiées ou inédites, jusqu'à ce jour au Danemark. Quatorze sources ont été dépouillées, y compris le Supplément inédit à la Flora Agaricina Danica de J. E. Lange et les 2000 aquarelles inédites de F. H. Møller. L'herbier du Museum de Botanique de Copenhague a également été recensé.

DE FUNGI VAN NEDERLAND. DE CLAVARIOIDE FUNGI. AURISCALPIACEAE, CLAVARIACEAE, CLAVULINACEAE, GOMPHACEAE, par R. A. MAAS GEESTERANUS Wetenschappelijke Mededelingen K. N. N. V. n° 113, 92 p., 62 figs., in 8°, 1977. Koninklijke Nederlandse Natuurhistorische Vereniging, G. Houtman, Draafsingel 36, Hoorn, Nederland; Nederlandse Mykologische Vereniging, C. Bas, Joh. Wagenaarlaan 12, Leiden, Nederland.

Parmi les Wetenschappelijke Mededelingen publiées par la Koninklijke Nederlandse Natuurhistorische Vereniging, six fascicules ont été consacrés jusqu'à ce jour aux champignons:
n° 34 De geslachten van Agaricales: Plaatzwammen en Boleten (G.L. van Eyndhoven)
n° 52 Geoglossaceae - Aardtongen (R.A. Maas Geesteranus)
n° 69 et 80 Pezizales I, II (R.A. Maas Geesteranus)
n° 88 Hypogaea (G.A. de Vries) et le présent fascicule. Dans celui-ci, Maas Geesteranus décrit 65 espèces des Pays Bas, appartenant à 10 genres de champignons clavarioides, pour lesquelles il donne des clés et commentaires suceptibles d'en aider l'identification.

THE NORTH AMERICAN CUP-FUNGI. OPERCULATES (1928-1942). INOPERCULATES (1951), par Fred J. SEAVER, 2 vol.378 p. , 23 figs., 74 pls. et 428 p., 150 pls. Réimpression J. Cramer 1978, cartonné toilé. J. Cramer, Lehre, Germany, Lubrecht & Cramer, Monticello, NY. Prix DM 80.- par volume.

Il est heureux que le beau livre de Seaver ait été à nouveau l'objet d'une réimpression. Sans aucun doute il sera encore apprécié par une nouvelle génération de mycologues, pour la qualité des observations et des illustrations qu'il contient. Mais il faudra que ceux-là sachent que ce livre doit être lu à la lumière de la taxonomie moderne des dicomycètes, comme celle définie par Korf dans le Fungi IVA de Ainsworth et Sussman, où les caractères anatomiques ont aujourd'hui une valeur diagnostique ignorée alors.

Bien que les planches photographiques aient perdu un peu de leur finesse à la reproduction, le livre est parfaitement réimprimé, sur bon papier et sous une solide reliure.

THE SPECIES CONCEPT IN HYMENOMYCETES, par H. CLEMENCON, éditeur, Bibliotheca Mycologica n° 61, 444 p., ill. col., in 8°, cartonné, 1977. J. Cramer, FL 9490 Vaduz, Lichtenstein. Prix DM 120.-, par souscription DM 96.-.

Il s'agit ici des actes du Symposium Herbette tenu à l'Université de Lausanne, du 16 au 20 août 1976.

Qu'est-ce que l'"espèce" chez les champignons? est bien une question que tout mycologue se pose et à laquelle bien peu peuvent répondre sans quelque réflexion. Ce fut bien le but de ce symposium, de tenter d'expliciter une notion d'espèce chez les Hyménomycètes qui rallie l'accord des 17 participants, Bas, Bigelow, Blaich, Boidin, Bresinsky, Clémençon, Esser, Horak, Kemp, Kühner, Oberwinkler, Peterson, Romagnesi, Singer, Smith, Thiers et Watling. A travers des exposés sur les Bolbitiaceae, les Boletaceae, les Agaricales, les Aphyllophorales, les Auriculariales, à travers les exemples des genres *Amanita, Clitocybe, Lactarius, Hygrophorus, Pleurotus* ou *Coprinus* et à travers les discussions, s'est bientôt dégagée, non une définition de l'espèce, mais plutôt une image multidimentionelle, génétique, biologique, morphologique, du concept d'espèce chez les Hyménomycètes. C'est dire toute la profondeur et l'amplitude de la question posée.

FUNGORUM RARIORUM ICONES COLORATAE. Pars VIII, par G. BOHUS et M. BABOS, 20 p., 8 pls. col. (n°57-64), 8 figs., in 8°, 1977. J.Cramer FL 9490 Vaduz, Lichtenstein. Prix DM 30.-.

Huitième partie d'un ouvrage qui lentement s'élabore. Commencé en 1966 par Reid, continué ensuite par Schild, puis Moser, l'ouvrage comporte aujourd'hui 252 pages et 64 planches d'aquarelles en couleurs. Cette huitième partie, elle, illustre 7 espèces, *Agaricus cupreo-brunneus, A. eglii, A. elvensis, Coprinus spilosporus, Inocybe aeruginascens, Leucopaxillus lepistoides* et *Tulostoma giovanellae*.

SEXUAL REPRODUCTION IN THE MUCORINAE, par A. F. Blakeslee, 328p., 58 figs. in The Proc. Amer. Acad. Arts and Sciences, 40 (4), 1904, réimprimé dans Bibliotheca Mycologica n° 48, in 12°, 1976. J. Cramer, FL 9490 Vaduz, Lichtenstein. Prix DM 40.-.

L'intérêt de la Bibliotheca Mycologica de J. Cramer est d'offrir au mycologuela réimpression de travaux mycologiques devenus rares. Le travail de Blakeslee sur la reproduction sexuelle des mucorinées est certainement de première importance en ce domaine. En effet, Blakeslee, non seulement mettait en évidence à lui seul la reproduction sexuelle chez autant d'espèces que toutes celles découvertes par ses prédécesseurs, mais il put grâce à l'usage de la culture pure en démontrer l'hétérothallie ou l'homothallie et découvrir le phénomène d'une ébauche d'hybridation entre les souches d'espèces différentes mais de signes opposés, signes (+) ou (-) qu'il put ainsi déterminer pour chacune des souches pures.

INDUKTION DER PRIMORDIENBILDUNG BEI DEM BASIDIOMYCETEN PLEUROTUS OSTREATUS, par Ursula von NETZER, Bibliotheca Mycologica n° 62, 95 p., 8 figs., in 8°, 1978. J. Cramer, FL 9490 Vaduz. Prix DM 25.-

L'induction d'abondantes ébauches de fructifications chez un dicaryon de *Pleurotus ostreatus* est obtenue en culture sur malt agar grâce à l'addition à la culture, à un moment donné du développement, d'une solution azotée (asparagine, glutamine) sous un éclairement de 500 à 1500 lux. La production de primorcia atteint 4000 unités par boîte de Pétri.

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